AN EFFECTIVENESS ANALYSIS OF THE TACTICAL EMPLOYMENT OF DECOYS

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

KENNETH S. BLANKS, CPT, USA
B.S., Stetson University, DeLand, Florida, 1982
M.S., Kansas State University, Manhattan, Kansas, 1993

Fort Leavenworth, Kansas
1994

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An Effectiveness Analysis of the Tactical Employment of Decoys

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This thesis examines the tactical employment of decoys. The Army invested $7.5M into fielding multispectral tactical decoys. Initially, many company commanders were reluctant to include the decoys in their tactical planning. Now, even more commanders believe that preparation for combat involves too many more important matters that preclude integrating this nonlethal system into their already time and resource constrained tactical operations. This thesis provides some insight into this concern and suggests ways in which decoys may be employed.

Analysis, both qualitative and quantitative in nature, is the original work of the author. Historical examples from WW II, Operation Desert Storm, and the Combat Training Centers provide qualitative data for the subjective of the combat effectiveness of decoys. Janus and CASTFORM wargaming results serve as quantitative data for a statistical assessment of decoy combat effectiveness.

The author concludes that decoys do enhance combat effectiveness when decoy employment is incorporated into the tactical scheme of maneuver.

Decoys, Multispectral Close Combat Decoy (MCCD), Deception 130

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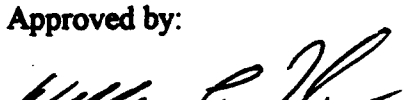 , Thesis Committee Chairman
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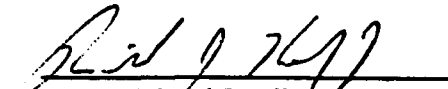 , Member
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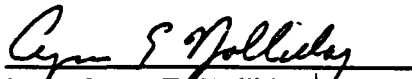 , Member
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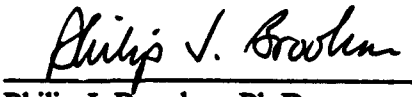 , Director, Graduate Degree Programs
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ABSTRACT

AN EFFECTIVENESS ANALYSIS OF THE TACTICAL EMPLOYMENT OF DECOYS by CPT(P) Kenneth S. Blanks, USA, 104 pages.

This thesis examines the tactical employment of decoys. The Army invested approximately $7.5 million dollars fielding multispectral (visual and thermal) tactical decoys. Initially, many company commanders were reluctant to include the decoys in their tactical planning. Now, even more commanders believe that preparation for combat involves too many more important matters that preclude integrating this nonlethal system into their already time and resource constrained tactical operations. This thesis provides some insight into this concern and suggests ways in which decoys may be employed.

Analysis, both qualitative and quantitative in nature, is the original work of the author. Historical examples from World War II, Operation Desert Storm, and the Combat Training Centers provide qualitative data for the subjective evaluation of the combat effectiveness of decoys. Janus and CASTFOREM modeling results serve as quantitative data for a statistical assessment of decoy combat effectiveness.

The author concludes that decoys do enhance combat effectiveness when decoy employment is incorporated into the tactical scheme of maneuver. Otherwise, the mere presence of decoys may actually jeopardize the tactical operation.

ACKNOWLEDGMENTS

Lest I fail to recognize anyone, I would like to thank, in advance, the many people who have assisted me in completing this study. Their number is indeed great. For quite some time, I have wanted to share my experiences in employing decoys with my brothers and sisters in arms. The Command and General Staff College and its Master of Military Art and Science program provided the perfect opportunity.

On behalf of Staff Group 11B, I would like to thank our Academic Counselor and Evaluator, LTC Troy Vaughn. He has fulfilled his role superbly. His guidance and encouragement will surely be our fondest memory of "the best year of your life."

Special thanks go to my thesis committee: LTC William Taylor, MAJ Richard Kilroy, and MAJ Cyrus Holliday. Dr. Hugo Mayer also rendered invaluable assistance, of which I am indeed grateful. Their knowledge and experience were invaluable. Never have I met a finer group of soldiers.

Finally, I would like to thank my lovely wife, Rhonda. Her love and devotion inspire me every day.

PREFACE

> Set up decoys and feign confusion, and give the enemy the impression we are about to quit our position. Then select our elite mounted troops, and send them on ahead into enemy territory under a cloak of silence . . . .[1]
>
> Sun Tzu, circa 500 BC

Sun Tzu advised military leaders to trick the enemy into acting against their own interests. By displaying false targets, it is possible to give a false picture of one's capabilities and intentions. This may delay and disrupt enemy intelligence and divert enemy fires in such a way that enables one to attack or counterattack unexpectedly. This notion of deceiving the enemy has as much relevance to the modern tactician as it did twenty-five centuries ago.

It was tempting to introduce this thesis with Master Sun's famous quotation, "Warfare is the art of deceit." After all, this thesis is a study of deception, and this short quotation, by the author of the first formal study of warfare, clearly asserts the importance of deception in battle. However, the more popular quotation does not accurately describe, nor accurately support, the scope and intent of this thesis, an effectiveness analysis of the tactical employment of decoys.

The first three chapters do address the fundamentals of deception and its application in general. After these chapters, the reader will quickly realize that the scope of this study narrows to an analysis of a specific means of deception at a specific level of war, the tactical employment of decoys. Historical and literature reviews provide a qualitative basis for analysis, while observations and computer simulations provide a quantitative basis for analysis of the effectiveness of decoys at the tactical level of war.

The desire to share personal experience and to gain insights into the contribution of decoys to combat effectiveness (lethality and survivability) were the primary motivations for this thesis. During my tenure as an M1A1 Abrams tank company commander in U.S. Army Europe (1987-1989), I was issued a set of multispectral close combat decoys (MCCD). I received no guidance on the proper use of these decoys, and no doctrine existed which adequately addressed the use of decoys in the field. Many of my contemporaries had some rather novel ideas for me to consider. Most simply kept the decoy systems sealed and stored in the supply room (for the sake of hand receipt integrity). A few, appreciating the realistic visual and thermal images that the decoys emitted, elected to use the systems as targets on practice gunnery ranges (TCPC). On rare occasions, commanders would employ the decoys in the field in an attempt to gain a tactical advantage over their opponent. I employed the decoys in the latter mode with great success.

In one instance, my company received an opposing force (OPFOR, Red) defensive mission at the Combat Maneuver Training Center (CMTC) at Hohenfels, Germany. This was not a popular mission in the early days of CMTC. Typically, the company team that performed this mission was frequently overwhelmed by the superior combat power of the attacking task force (TF). The Soviet-style strong point defense became known as the "training aid" mission. Decoys and many motivated soldiers helped to change this conception.

The "training aid defense" oriented west (depicted in Figure 1) and the Blue TF generally attacked eastward. The company team consisted of one M1A1 tank company and the battalion scout platoon. In preparation for the strong point defense, we emplaced several obstacles and barriers in hopes of forcing the Blue TF to maneuver into the only fire sack available. The battalion scouts formed the security zone and the tank company made up the company main defensive area. One company sized avenue of approach

concerned me; it could easily roll up the northern flank and lead to my unit's demise. I accepted the risk. The Red tank platoon in the north would shift fires to the north, on order. Also, we set up the decoys (seven of them) in front of the northern approach with the intent of delaying the enemy's advance long enough for fires to respond to an attack in that direction.

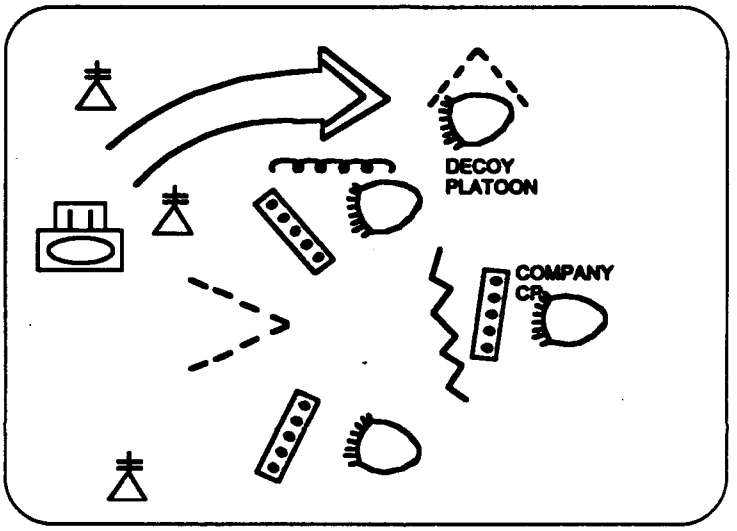

Figure 1. Training aid defense

Around midnight, the Blue TF conducted a feint towards the prepared fire sack and maneuvered the majority of the battalion along the northern approach that had been the cause of concern earlier in the day. The Blue TF expended many rounds before the northern tank platoon could reorient. When the Red northern tank platoon did reorient on the troublesome approach, they were amazed at what they saw. The Blue TF was firing

and maneuvering on the decoy platoon! This situation presented splendid flank shots to the northern platoon that were readily exploited.

Although Blue lost nearly their entire lead armor team in that preliminary engagement, events began to turn in Blue's favor. The northern Red tank platoon was reduced to one tank and his thermal sights were out. Then the Blue TF commander made a fateful decision. He turned the entire TF around and redirected his sole effort into the middle of the prepared fire sack. This maneuver resulted in virtually every remaining Blue combat vehicle's destruction in little over an hour.

During the road march back to the base camp, I thought of the contribution that the decoy platoon had made during that night attack and how fortunate it was for me that I brought the decoys to CMTC. I have been fascinated by decoys since that day. I hope this thesis will shed some much needed light on the potential contribution that decoys can offer the small unit commander and perhaps arouse the Army's interest in deception operations once again.

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CHAPTER 1

INTRODUCTION

Background

Throughout history, deception has proven to be a fundamental element of successful warfighting. Deception may be defined as, "those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests."[2] The critical phrase in this definition is, "induce him to react." The purpose of deception is not so much what the commander wants the enemy to believe, but rather more what the commander wants the enemy to do.

One of the first recorded uses of deception occurred during the Trojan Wars. For ten years, the city of Troy withstood siege by the Greeks. Finally, the Greeks devised a clever deception to breach the seemingly impregnable walls of the city. Several Greek warriors hid inside a huge wooden horse while the rest of the army sailed away pretending to abandon the feint. The Trojans dragged the horse inside the walls of the city to celebrate their victory. Later that night, the Greek fleet returned and the warriors that were inside the wooden horse opened the gates of Troy. The Greek Army totally surprised the Trojans and destroyed the Trojan city. Troy's defenses held out against siege for a decade but fell victim to deception in a single night.[3]

Despite innumerable historical examples of deception contributing to victory, the U.S. Army has paid little attention to the subject. The Army's own doctrinal manual on deception (FM 90-2) charges, "Today, commanders use little deception in planning,

directing, and conducting combat operations."[4] Efforts to revitalize this lost art have usually succumbed to higher priorities and dwindling defense budgets.

The most recent and valiant attempt to integrate deception into Army doctrine occurred in the late 1980s. At that time, a number of senior leaders concluded that the Army's deception program needed a great deal of work. On January 6, 1986, the U.S. Army Intelligence Center and School (USAICS) established the Battlefield Deception Office as the Army's focal point for deception.[5]

The USAICS did a credible job under the limitations in which they were operating. As a TRADOC center and school, they had no tasking authority over the rest of the Army's schools and centers. Their efforts to revitalize battlefield deception met with little fanfare by the other Army schools and centers.[6] In spite of that, the USAICS assembled a force structure and actually fielded it under very strict time constraints. This force structure called for the addition of deception elements to the corps and division staffs. These corps and division deception cells have conducted deception planning since their inception; however, their roles have diminished since then. Indeed, their very existence is in jeopardy today. One proposal calls for the positions assigned to deception planning cells to transition to unmanned aerial vehicle (UAV) operators.[7]

Additionally, the USAISC published a revised FM 90-2, *Battlefield Deception* in October 1988 and, working with Army Material Command, fielded a limited quantity of tactical decoys. The deception field manual discusses some theoretical principles of deception but offers very little to the soldier concerning the application of battlefield deception. Its section concerning the tactical employment of decoys is vague and geared more towards the emplacement of false logistics facilities than the emplacement of false combat vehicles and equipment. Unfortunately for those desiring to use the multispectral close combat decoys (MCCD), there is no discussion of these recently fielded tactical decoys. FM 90-2 is inadequate.

MCCDs enjoyed a brief popularity following their initial fielding. On December 28, 1987, A *Washington Post* headline read, "Army is Reviving Art of Deception." This article praised the Army's discovery of a low cost combat multiplier. "A fake M1 costs about $3500, compared with about $3 million for a new M1."[8] Further national interest resulted from a segment aired by ABC's *20/20* program. The program highlighted the decoy's potential for hardware and personnel survivability as well as the decoy's potential for achieving surprise.[9]

Visiting U.S. Army installations and military communities, one would likely have surmised that the Army had fielded a novelty or a photo opportunity. The MCCDs were a hit at static displays at many public military demonstrations. The new tactical decoys seemed to be everywhere but where they were intended, in the field. The lack of a doctrinal basis for the tactical use of decoys caused many commanders to question the value of MCCDs on the battlefield.

This doctrinal deficiency and dwindling resources ultimately contributed to the demise of USAICS's efforts to revitalize the lost art of deception. In 1988, the Army disbanded the Battlefield Deception Office. Subsequently, the US Army Training and Doctrine Command (TRADOC) assumed leadership of the Army's deception efforts to ensure that deception integration occurred in other mission areas outside of intelligence.[10]

In August 1989, TRADOC assigned responsibility for deception to the Combined Arms Command (CAC) Development Activity (CACDA) which organized a TRADOC Program Integration Office (TPIO) for deception.[11] Since then (1993), interest in deception has further declined and the deception program at the TPIO has been relegated to a one man deception point of contact at the Command and Control (C^2) Directorate of CAC.

The three dimensional MCCD procurement has met a fate similar to that of its parent two dimensional MCCD. The current CAC deception representative cites the

Army's conversion to JP-8 fuel, system weight exceeding 200 pounds, the inconsistent ability to withstand three or more direct fire rounds, and the inability to withstand wind speeds in excess of forty knots as major limitations of the proposed three dimensional MCCD. The lack of a concept for doctrinal use of the decoys and limited resources essentially undermined efforts to improve the two dimensional version of the MCCD. Although procurement of the three dimensional systems is doubtful, type classification of the three dimensional MCCD is still possible.[12]

Purpose

The purpose of this thesis is to determine whether the tactical employment of decoys enhances combat effectiveness. The Army invested approximately $7.5 million dollars into fielding multispectral (visual and thermal) tactical decoys. Initially, many small unit (battalion and below) commanders were reluctant to include them in their tactical planning. Now, many more commanders question the worth of combat vehicle decoys. In their minds, preparation for combat involves more important matters that preclude integrating nonlethal systems into their already time and resource constrained tactical operations. This thesis offers some insight into this concern and suggests ways in which decoys may be employed. Both qualitative and quantitative data are utilized to address the thesis question.

Thesis Question

Does the tactical employment of decoys enhance combat effectiveness? This thesis question is the same question that may enter the mind of a commander presented with the opportunity to use tactical decoys. Often one expects that a new combat system will add a certain value to the force, however that value added must be expressed in terms of cost benefit. The value added (if indeed there is a value added) must demonstrate a

significant improvement over the existing situation and cost of the system. The system which does not demonstrate a significant improvement in a unit's ability to conduct battle or survive in battle will likely be rejected, either before or after procurement.

Subordinate Thesis Questions

In order to sufficiently answer the primary thesis question, the analysis must also answer the following subordinate questions.

1. Does history offer examples of the use of decoys in combat?
2. Did the use of decoys enhance combat effectiveness?
3. Does contemporary force-on-force modeling and simulation indicate that decoys provide any significant improvement to combat effectiveness?
4. How may the tactical unit commander employ decoys on the modern battlefield to enhance combat effectiveness?

Assumptions

1. The effect of employing decoys in the tactical environment can be accurately measured.
2. Historical examples provide valid qualitative data for measuring the contribution of decoys to combat effectiveness.
3. TRADOC approved models (Janus and CASTFOREM) and scenarios provide valid quantitative data for measuring the contribution of decoys to combat effectiveness.

Limitations

Any study of a particular means to deceive the tactician warrants a review of the literature on the broader topic of battlefield deception. A brief review of military

deception serves as a basis for understanding the more specific aspect of employing decoys on the battlefield. This thesis' analytical scope is limited to the use of combat vehicle decoys at the tactical level of war.

Delimitations

There are many forms of decoys that one may consider in a study of deception. The decoys considered in this thesis do not exceed the capabilities of the U.S. Army multispectral close combat decoy (MCCD, Part Number 13228E9647). One may consider these decoy types to be a lesser form of counter-image intelligence (IMINT) devices. The decoys in this thesis are designed to deceive visual, photo, thermal, and infrared imagery collection sensors but are not designed to counter sophisticated ground surveillance radar or overhead imagery.

Systems designed to counter signal intelligence (SIGINT) sensors, communications intelligence (COMINT) sensors, and electronic intelligence (ELINT) sensors exceed the scope of this thesis. Highly trained human intelligence (HUMINT) collectors (e.g., espionage agents) are also excluded from the scope of this study although the deception of combat reconnaissance elements is considered as a lesser form of counter-HUMINT.

Research Method

This thesis contains both qualitative and quantitative analysis. The measures of combat effectiveness, in both analyses, are lethality (the ability of a unit to kill the enemy) and survivability (the ability of a unit to survive a battle). Reviews of doctrine, history, and sister service utilization of decoys support the qualitative assessments. Statistical analysis of the output from Janus and CASTFOREM models provide a platform for a quantitative assessment of decoys. The results of interviews provided information enhancing the background discussions. A thorough review and consolidation of the findings precedes the conclusions and forms the basis for recommendations.

CHAPTER 2

DOCTRINE AND LITERATURE REVIEW

The purpose of this chapter is to familiarize the reader with relevant U.S. doctrine and review the academic works on deception used in this thesis. When applicable, the author's discussion of decoys will be expounded.

While deception is a rather broad topic, encompassing numerous means to mislead the enemy into a predictable course of action or inaction, surprisingly little has been published on the topic. There is even less material available that addresses the use of military decoys. The first section, entitled Doctrine, supports this observation. Whereas both joint doctrine and service doctrine are presented, few doctrinal publications exist that discuss deception and even fewer of these provide truly substantive information worthy of mentioning. The section entitled Literature is divided into two subsections: Classical Works and Contemporary Works. In the Classical Works subsection, the views of Sun Tzu and Carl von Clausewitz appear. In addition to illuminating the principles of deception, these theorists provide opposing views on the importance of deception in warfare. The works discussed in the Contemporary Works subsection were vital to this investigation of decoys and are recommended for future studies in the art of deception.

Doctrine

> Warfare today is a thing of swift movement -- of rapid concentrations. It requires the building up of enormous firepower against successive objectives with breathtaking speed. It is not a game for the unimaginative plodder.[1]
>
> General George C. Marshall, 1941

These are exciting times. Freedom and democracy enjoy a world popularity as never before. The end of the Cold War and the demise of the Soviet Union have brought many changes to the global community and new challenges to the U.S. Army. As new and independent nations seek to secure their places in the new world order, renewed ethical and religious strife, weapons proliferation, terrorism, and drug trafficking unfortunately threaten to undermine their ambitions.

General Marshall's description of warfare is particularly relevant today as the United States prepares for the challenges of the future. Innovation and versatility are key ingredients to successfully securing America's interests in the future. While the risk of global war is less likely, formidable forces continue to threaten our national security interests. The new force projection Army must respond to regional conflicts that may erupt anywhere at a moments notice. The nature of conflicts are now unpredictable and require a versatile force capable of meeting a diversity of mission requirements.

The basic approach the Army will take in meeting these requirements is expressed in its doctrine.

> Doctrine is the statement of how America's Army, as part of a joint team, intends to conduct war and operations other than war. It is the condensed expression of the Army's fundamental approach to fighting, influencing events in operations other than war, and deterring actions detrimental to national interests. As an authoritative statement, doctrine must be definitive enough to guide specific operations, yet remain adaptable enough to address diverse and varied situations worldwide.[2]

Deception might offer a cost effective means to enhance America's force projection requirements. However, the Army's approach to battlefield deception is difficult to discern. The limited joint doctrine that discusses the subject is rather incoherent and does not integrate well with the current Army deception doctrine.

Joint Doctrine

The 1986 Goldwater-Nichols Department of Defense (DOD) Reorganization Act enhanced the abilities of the Army, Navy, Marine Corps, and Air Force to integrate their unique capabilities into the collective effort of a superior joint team. As the services transition to smaller forces tailored for regional crises, their dependency on joint and combined training and doctrine will increase. Oddly, joint training appears to have progressed more than the joint doctrine. Forced entry and contingency exercises are now common at the Combat Training Centers (CTCs). The Joint Readiness Training Center (JRTC) has a particularly impressive record of integrating training from all the services into quite successful exercises. Training at the Combat Maneuver Training Center CMTC frequently simulates United Nations missions in its multinational training exercises.

For the most part, joint doctrine is still evolving. Of the 192 titles which currently exist in the joint publications system, 130 are in various stages of development or revision.[3] The recent establishment of the Joint Warfighting Center (JWC) will assist the Chairman of the Joint Chiefs of Staff (CJCS), combatant commanders, and service chiefs in refining both training and doctrine; however, future success in the new world order will largely depend on the continued contributions and refinements by the leadership at every level of war.

Joint Pub 3-58, *Doctrine for Joint Operational Deception, Draft* (June, 1992)

> The development of a deception organization and the exploitation of deception opportunities are considered to be vital to national security. To develop deception capabilities, including procedures and techniques for deception staff components, it is essential that deception receive continuous command emphasis in military exercises, command post exercises, and in training operations.[4]
>
> JCS Memorandum of Policy 116

JCS Pub 3-58 is currently the only joint doctrinal publication that addresses deception operations. This draft publication provides basic doctrine governing joint activities for U.S. Armed Forces in matters of operational deception. It does not prescribe tactics, techniques or procedures for application of military deception; therefore, the use of Joint Pub 3-58 in this thesis will be limited to defining deception terms common to all services.

Army Doctrine

U.S. deception doctrine is elusive. One researching the subject would likely conclude that the Army is not very interested in deception. Historically speaking this is generally true. Little is written about deception in current doctrinal terms and even less analysis has been conducted to study the potential contributions of deception.

According to the Center for Army Lessons Learned (CALL), battlefield deception is not widely used, trained, and understood partially due to four common misconceptions:

- Surprise comes from luck.
- Deception plays a trivial part in warfare.
- Tremendous growth in intelligence collection capabilities has eliminated the probability of deceiving a sophisticated opponent.
- Deception is only for combatants.[5]

The CALL asserts that these perceptions are erroneous. Historical studies show that deception results in surprise about 50 percent of the time and "the more collection capabilities an opponent has, the greater the opportunities to feed him specifically designed false information."[6]

AR 525-21, *Tactical Deception Policy* (June 1982)

AR 525-21 is the sole Army regulation that governs tactical deception operations. The Tactical Deception Policy defines the role of deception in tactical combat operations

and designates command responsibilities. The definition of tactical deception agrees with that defined in JCS Pub 3-58 but adds the corps level and below limitation of scope. According to the regulation, tactical deception has a dual role. One role is to develop a level of competency in all Army elements to defeat enemy surveillance, target acquisition, and intelligence gathering by hiding the real. The second role of tactical deception is to create false impressions that mislead the enemy into courses of action adverse to his interests. MAJ Charles L. Hacker points out in his 1985 thesis that AR 525-21 actually assigns commanders only an objective and not a requirement to incorporate deception into major field training exercises. Consequently, deception is neither stressed nor practiced by many headquarters.[7] Although the Army rediscovered deception in the late 1980's, Hacker's charge rings true today.

FM 100-5, *Operations* (June 1993)

In June 1993, the Army welcomed the official herald of the new Army operations doctrine, FM 100-5. FM 100-5 is the Army's principle warfighting doctrine which provides the foundation for subordinate doctrine, force design, material acquisition, professional education, and individual and unit training. "It describes how to think about the conduct of campaigns, major operations, battles, engagements, and operations other than war."[8]

The 1982 version of FM 100-5 had six instructive discussions concerning deception; whereas, the 1993 version has but three brief mentions of deception. According to the 1982 version, deception is an operation security (OPSEC) measure that creates a false picture of friendly activities and operations. A detailed intelligence preparation of the battlefield (IPB) must precede deception operations. The effective integration of deception into operation plans receives considerable attention in the section describing defense and breakout. Electronic deception is also explained quite sufficiently

in the electronic warfare section of the 1982 version of FM 100-5. There is even a specific mention of the use of decoys in the section dealing with desert environments.

In defense of the new Army Operations treatment of deception, FM100-5 does warn subordinate commanders to ensure that their deception operations complement the higher headquarters deception plan. If it were not for the index though, deception would probably go unnoticed in the 1993 version of FM 100-5. The new doctrine ostensibly relegates deception to just a factor that can contribute to surprise.

FM 20-3, *Camouflage* (November 1990)

FM 20-3 treats survivability and camouflage as synonymous terms. It is an excellent source of camouflage principles for company-level leaders. Although this field manual refers the reader to FM 90-2 for deception doctrine, FM 20-3 does make three points about the tactical employment of decoys that are worth noting.

> a. Use decoys to confuse the enemy. The goal is to divert enemy resources into reporting or engaging false targets. An enemy who has identified decoys as *real* is less inclined to search harder for a well hidden target.
>
> b. The threat may interpret decoy construction as efforts to reinforce defensive positions. Activities such as laying fake minefields and building bunkers and positions can conceal actual offensive preparations and give the enemy the impression that defenses are being improved.
>
> c. Use decoy positions and obstacles to draw enemy attention away from actual survivability positions and obstacle traces. Decoys serve the additional function of drawing enemy fire, allowing easier targeting of threat weapon systems.[9]

The M1 tank decoys were originally fielded as a survivability tool. However, the tactical employment of decoys is only limited by one's imagination.

FM 90-2, *Battlefield Deception* (October 1988)

The previous version (August 1978) of FM 90-2 was entitled *Tactical Deception*. Its primary purpose was to provide guidance to tactical commanders and their staffs on how to plan, employ, and provide a means to deceive the enemy on the battlefield. This manual's explanatory style is praiseworthy. FM 90-2, *Tactical Deception* explains the principles of tactical deception with remarkable clarity. The illustrated examples offer practical solutions for achieving surprise, and the numerous historical vignettes add eloquence to the manual and further enlighten the reader.

A noteworthy approach that the 1978 version of FM 90-2 takes is to stimulate the reader's imagination. Success of deception operations often requires innovative techniques, for even elaborate deception techniques are readily predictable when repeated. "Thought provoking ideas help the tactical commander to expand, adjust, and envision on the battlefield; but most of all, these ideas should trigger his imagination."[10]

Examples of and guidance in the use of decoys abound in FM 90-2, *Tactical Deception*. According to the manual,

> Decoys are extremely important in deception planning. Plastic or inflatable decoys may be available. If not, the commander can use such locally available items as telephone and fence poles, posts, logs, ammunition cylinders, or other objects to fabricate decoy devices. A log sticking out of a pile of brush can draw a lot of attention and artillery fire.[11]

This publication remains an invaluable resource for tactical deception doctrine in spite of the fact that it is technically obsolete. It is, however, relevant to the tactical command and staff and particularly to this thesis. The current 1988 version is not so.

General Vuono said that deception is common sense soldiering. A soldier attempting to familiarize himself with current deception doctrine would be hard pressed to come to that conclusion. The 1988 version of FM 90-2, *Battlefield Deception*, attempted to integrate the operational level of war into the Army's deception doctrine of 1978. In doing so, the "how to" lessons of the past were lost in the revision, and what resulted was

essentially a collection of thoughts on deception that border on the metaphysical and does not meet the DOD definition of doctrine. Theoretical phrases such as "human information processing," "cry wolf," the "monkey's paw," and "Jone's dilemma" have little relevance to the soldier when the terms are neither defined nor applied to the modern battlefield.

Navy Doctrine

Many of the considerations for deploying forces on the sea are the same as those for deploying forces on land. In order to concentrate superior firepower at the critical time and place, leaders on both surfaces must be proficient in such things as gunnery, navigation, and communication. Often the critical time and place a commander must strike the enemy is when and where the enemy least expects a strike. Both land warfare and sea warfare favor commanders that can effectively maneuver their forces and outwit their opponents. Deception may help them to do just that.

The Navy holds a lot of faith in the value of deception and particularly in the value of decoys as a means to deceive. To protect a vessel, the Navy may use a towed off-board active decoy or TOAD. "TOAD comprises a small boat, towed behind the parent craft, which mounts a radome containing ESM and ECM elements."[12] The purpose of this and other off board decoys is to offer a missile an alternative target for which to destroy.

Submarines, by their very nature, are often in the business of deception. They can strike virtually undetected and at will into the enemy's vulnerable areas. Submarines also use decoys of the acoustic countermeasures type to distract an enemy torpedo. "These units which can be launched by surface vessels as well as via a submarine's signal ejector, are autonomous when in the water and are rather similar to a miniature torpedo."[13]

While all the services share a common understanding of the principles of deception, the Navy's deception doctrine contains a great deal of information that is

unique to sea warfare. Much of this information is highly technical and, for the most part, also classified. Therefore, the reference cited in this subsection will provide only a superficial look at the U.S. Navy's deception doctrine.

NWP 34, *U.S. Navy Operational Deception* (SECRET) (July 1980)

This doctrinal publication explains many important and unique planning considerations for deception at sea. Due to its technical nature, most of the information is classified SECRET and cannot be divulged in this thesis. However, a summary of the UNCLASSIFIED portions of NWP 34 is provided.

An opponent acts on information, not a lack of information. In the Navy's doctrine, many elaborate procedures are prescribed to conceal a unit's true disposition. The Navy recognizes that this is only half of deception and results in a void of information that may actually attract unwanted attention from the enemy. Often, deception is accomplished when that void is filled via simulation. The Navy uses the word "simulation" as a doctrinal term that means not only "portraying the false" but also using sophisticated technology to communicate false information to the enemy decision-maker and to fill in those gaps of information created by evasion, concealment, and diversion. According to NWP 34, "Simulation is the primary method used to convey information to a deception target. Simulation deceives the enemy by counterfeiting a characteristic, a unit, or an operation in order to distort or misrepresent own capabilities or intention."[14]

NWP 34 professes that decoys are tools of simulation. "Decoys may be physical objects with characteristics similar to those of the evading units, or counterfeit presentations to enemy detection devices created by manipulation of friendly or enemy (or both) [electromagnetic] EM and acoustic signals. Decoys may employ a combination of deception means and techniques to satisfy the various enemy detection capabilities."[15] The Navy's use of the word decoy actually combines the meanings of dummy and decoy. The

dummy merely imitates something on the battlefield; whereas, the decoy is something (that may or may not resemble anything else on the battlefield) that draws the enemy's attention away from some other area.

Air Force Doctrine

Like the Navy, the Air Force's deception operations rely heavily on sophisticated technology. Much of the peculiarities of applying this technology is enshrouded in secrecy and beyond the scope of this thesis. With the advent of stealth technology, new approaches to operations security (OPSEC) and deception will likely result, but for the moment, doctrine will have to wait.

In general, the Air Forces' military decoys are also quite sophisticated. Except for some use of mock-ups of aircraft that distract enemy pilots attacking an airfield, Air Force decoys are used primarily to spoof specific collection devices as opposed to diverting the attention of enemy decision-makers. These collection devices include both active and passive radiation collectors that may be fixed at an installation or mounted in the guidance system of an antiaircraft missile.

Chaff is probably the oldest and most common decoy in the Air Force system. Despite its simple appearance, chaff is a sophisticated material designed to reflect high frequency radiation. "A single piece of chaff is, essentially, a dipole reflector. It can be comprised either of a thin piece of aluminum or other metal foil but is more likely to be a fibre or nylon filament which is metalisized to provide a reflective surface."[16]

AFR 55-49, *Deception in Support of Tactical Operations*

Currently, there is no Air Force manual that addresses the applications of deception that are unique to the service. AFR 55-49 as a source provides only general guidance for conducting deception operations, defines some deception terms, and assigns

responsibilities to Air Force personnel in support of tactical deception operations. Discussions of the tactical employment of decoys are cursory.

Marine Corps Doctrine

OH 7-13, *Military Deception* (June 1986)

Being primarily a land force, one might expect the U.S. Marine Corps' deception doctrine to resemble that of the Army's. In fact, OH 7-13 cites FM 90-2 early on as a "significant reference with which the interested individual should be familiar."[17] This handbook's treatment of deception principles, planning, and training is practically the same as that of the 1978 version of FM 90-2, *Tactical Deception*. The difference between OH 7-13 and the 1978 version of FM 90-2 is the inclusion of a dedicated section on OPSEC and a section devoted to deception in amphibious operations.

Literature

Classical Works

> Warfare is the art of deceit.
>
> Sun Tzu, circa 500 BC[18]

> It is dangerous, in fact, to use substantial forces over any length of time merely to create an illusion; there is always the risk that nothing will be gained and that the troops deployed will not be available when they are really needed.
>
> Carl von Clausewitz, circa 1827[19]

Before setting out to analyze a given circumstance or phenomenon, one should review the applicable theory. Although many theorists have pondered deception on the battlefield, the works of Sun Tzu and Carl von Clausewitz were selected for inclusion in this thesis because their works represent opposing views that permeate the Army today.

Generally, commanders either consistently incorporate some form of deception into their operations or they rarely do.

Sun Tzu, The Art of Warfare

Deception is the most frequently discussed topic in *The Art of Warfare*. In war deception takes on many forms. "Sun Tzu's definition of deception is very broad indeed: it includes both active and passive measures, from elaborate deception plans, simple baits, and diversion to secrecy and concealment."[20] According to Sun Tzu, deception is key to victory and should be a central part of every battle plan at every level of command. Sun Tzu states that in order to deceive the enemy, one should observe certain maxims:

- When able, seem unable; when ready seem unready
- When nearby, seem far away; and when far away, seem near
- If the enemy seeks some advantage, entice him with it
- Attack where he is not prepared; go by way of places where it would never occur to him you would go
- Offer the enemy a bait to lure him; feign disorder and strike him.[21]

The current focus of U.S. doctrine, "hiding the real and portraying the false," is firmly rooted in these principles offered by Sun Tzu. By successfully hiding the real, the enemy will not disrupt the true operation nor discover the deception. When the false is successfully portrayed to and received by the enemy, he will respond in a manner detrimental to him and beneficial to the deceiver.

The first maxim describes the most frequent deception technique discussed in *The Art of Warfare*, feigning weakness. When the deceiver is able and portrays that he is not, the unit's true capability is hidden while the false is portrayed. "Such 'good news' is always welcomed by one's enemy who is gradually lulled into a false sense of security."[22] The effect of hiding one's location is compounded when one portrays a convincing false battle position somewhere else. Sun Tzu's third maxim supports Magruder's Principle -- the exploitation of perceptions. "It is generally easier to induce an enemy to maintain a

pre-existing belief than to present notional evidence to change that belief. Thus, it may be more useful to examine how an enemy's existing belief can be turned to advantage than to attempt to change his beliefs."[23] The fourth maxim is rather apparent. B. H. Lidell Hart contended that "the indirect approach is the most effective way to upset the enemy's balance, psychological and physical, thereby making his overthrow possible."[24] The final maxim is central to this thesis. Decoys often serve, in a sense, as bait that is presented in hopes of drawing the attention of the enemy away from the real person, object, or phenomenon so that the objective of deception may be met. That objective may very well be turning the enemy's flank so that one may be in a better position to "strike him."

Carl von Clausewitz, On War

Carl von Clausewitz held very little faith in the value of deception. He like many tactical leaders today, saw the use of deception as a last resort, a tool for the desperate.

> The bleaker the situation with everything concentrating on a single desperate attempt, the more readily cunning [deception] is joined to daring. Released from all future considerations, and liberated from thoughts of later retribution, boldness and cunning will be free to augment each other to the point of concentrating a faint glimmer of hope into a single beam of light which may yet kindle a flame.[25]

Warfare entails great expenditures of resources including manpower, equipment, and time. To prepare an adequate deception plan requires an excessive expenditure of these resources, according to Clausewitz. Precious resources would be better utilized if applied to the fight.

> To prepare a sham action with sufficient thoroughness to impress an enemy requires a considerable expenditure of time and effort, and the costs increase with the scale of the deception. Normally they call for more than can be spared, ...[26]

Clausewitz favored concentrating superior force at the decisive point to achieve victory on the battlefield. In Chapter Eleven, he wrote, "the best strategy is always to be very strong; first in general, and then at the decisive point."[27] A thorough understanding

of this principle is more important to the commander than cunning, according to Clausewitz. Ostensibly, he prefered an intelligent commander to a deceptive (cunning) battle commander. Clausewitz adds that "the latter [cunning] will do no harm so long as it is not employed, as it all too often is, at the expense of more essential qualities of character."[28]

The difference in theories between Sun Tzu and Carl von Clausewitz is largely due to their level of analysis. Sun Tzu advocates the use of deception at all levels of war while Clausewitz examines the effectiveness of deception from primarily the strategic perspective. Although Clausewitz does not promote deception at the tactical level of war, one may infer from his sentiments on surprise that there is a place for deception (as a means of surprising the enemy) at the tactical level of war where time and space are on a smaller scale.

Contemporary Works

Department of the Army, Battlefield Deception Janus(T) Wargaming, (1988)

This Army report provides the results of Janus(T) wargaming conducted to study the effect of decoys on the battlefield. Three different decoy employment parameters were examined: the presence of decoys (decoys vs no decoys), the location of decoys (collocated, deep and rear), and the ratio of real systems to decoys ratio.[29] The model scenario involved a Blue armored task force defending against an attacking Red tank regiment in European terrain. Data from this report supports the quantitative analysis of this thesis.

Dewar, *The Art of Deception in Warfare*, (1989)

Colonel Dewar's work provides several examples of decoys in battle, past and present. He also devotes a good portion of his book to the former Soviet Union's thought on deception (*maskirovka*). The Soviets were long renown for their deception expertise. Chapter Eleven deals with countering deception. Dewar's "golden rule" about not jumping to conclusions is worth considering in any combat operation. There is a popular adage in the Army today that is relevant, "If you get carried away in war, you will get carried away."

Freeberg, *Camouflage and Decoy Sensitivity Analysis*, (1991)

This study measures the effectiveness of camouflage and decoys in the Airland Battle. The basis of this study is force-on-force modeling using the Combined Arms and Task Force Evaluation Model (CASTFOREM). CASTFOREM is a high resolution (brigade and lower echelons), computerized, event sequenced combat simulation model which simulates a combined arms conflict. Major functional areas modeled include:

- Mounted Ground Combat
- Dismounted Ground Combat
- Tactical Air
- Command and Control
- Electronic Warfare
- Army Aviation
- Nuclear/Chemical Effects
- Engineer and Mine Warfare
- Air Defense Artillery
- Directed Energy Weapons[30]

Decision tables serve as user input and provide for actual tactical decision-making. Attrition, acquisition, movement, communications, and engagements are all resolved at the system level. CASTFOREM uses digitized terrain of normally 100 meter grid square resolution. Terrain box size varies. The largest played to date is 37 km by 22 km. Digitized terrain data is available for Europe, Southwest Asia, North America, Central America, and Korea. Three scenarios were run in Freeberg's study: Southwest Asia Meeting Engagement 29.5, European Defense 3.15, and European Offense 12.7.[31]

Gooch and Perlmutter, ed., *Military Deception and Strategic Surprise*, (1982)

This anthology contains the contributions of many authorities in the field of deception. Deception is treated as a force multiplier throughout the book. Barton Whaley provides two works: one on the covert rearmament of Germany (1919-1939) and one on the theory of deception. Michael Mihalka discusses the Soviet Strategic Deception from 1955 through 1981. Janice Stein's contribution ties deception with surprise. The difference between offense and defense is often determined by the principle of war, surprise. Stein contends, "A number of implications flow from this blurring of distinction between offense and defense. Most important deception becomes easier to execute and surprise becomes more likely. . . . The military evidence before their eyes does not speak for itself; it is often ambiguous."[32] Michael Handel's contribution, "Intelligence and Deception," is especially thought provoking. He offers warnings concerning the use of deception, "While extremely helpful in war, deception frequently failed, or failed to achieve its intended objectives, and on occasions has even proved to be counterproductive."[33]

Hartcup, *Camouflage, A History of Concealment and Deception in War*, (1980)

This book examines the history of camouflage as a form of concealment. Hartcup states that there are two aspects of concealment: one is the merging of troops and equipment into the background by natural and artificial means, the other is disguising troops and equipment to appear as something other than a combat target.[34] Fortunately, the author also felt obliged to discuss deception and decoys. Many historical examples are presented with rare photos of actual equipment in use. These examples span all the services and both world wars.

Summary

The review of deception doctrine and deception literature presented is not all inclusive. There are several Army field manuals that mention deception operations, but their brief explainations are not vital to this study of decoys. Many contemporary works on deception tend to focus on the strategic level of war, and thus exceed the scope of this thesis.

CHAPTER 3

HISTORICAL ANALYSIS

This chapter marks the transition from problem definition to analysis. Specifically, the purpose of this chapter is to provide a qualitative assessment of decoys based on historical accounts. Two historical events are analyzed in this chapter: the Battle of Britain (1940) and the Battle of El Alamein (1940-1943). A brief summary introduces each historical event and the event's supporting deception operations which included the use of decoys. Subjective evaluation of the use of decoys is based on the recorded effectiveness of the decoys in combat and the subsequent testimonials of persons that were knowledgeable of the deception operations and the effectiveness of decoys.

In World War II, the Germans relied on their military encryption device (called Enigma) to pass extremely sensitive radio traffic to various German high commands.. The Allies also devoted extensive efforts to protecting their radio traffic. However, the Allies enjoyed a distinct advantage over the Germans because they had Ultra which was a means to decrypt the German Enigma traffic. "In particular it was the Poles' early success in attacking Germany's military machine cipher (Enigma), subsequently revealed to the French, which eventually allowed the British to break Enigma on a regular basis, thus laying the foundations for the Ultra organisation, which disclosed information of truly war-winning value to the Allies from late 1940 onwards."[1]

Ultra was also a very effective means of feedback for deception operations. There was no better way to verify that the enemy had accepted the deception story than to have the enemy admit the fact over what he considered secure radio traffic. Fortunately,

much of this feedback was recorded. This feedback also lends itself to an accurate assessment of the deceptions of World War II.

Battle of Britain

The Battle of Britain was a series of aerial engagements between the RAF and the German Luftwaffe. Adolf Hitler intended for this air war to secure German air superiority in the theater and establish favorable conditions for an invasion of Britain (code named Operation Sealion). Führer Directive 16 ordered the Luftwaffe to facilitate "a landing operation against England," to "prevent all air attacks," engage "approaching naval vessels," and "destroy coastal defenses. . . break the initial resistance of the enemy land forces and annihilate reserves behind the front."[2]

Many factors contributed to the RAF's victory in the Battle of Britain. Air power theorists greatly underestimated innovations in air defenses. The combination of fast-climbing monowing fighters, the Ultra intelligence source, and radar interception techniques made it possible for defending forces to exact a very high price from bombers attempting to penetrate forward air defenses. Radio traffic detailing the Luftwaffe's plans of attack was often deciphered by Ultra days before the raids were scheduled to launch. When the Luftwaffe did attack, its strength and position were confirmed by Britain's radar defenses.

Deception also contributed to Britain's success in the Summer of 1940, particularly at the tactical level. Generally, the three means that small units used to deceive enemy bombers were smoke, camouflage, and decoys. Hiding the real target with smoke and camouflage was sometimes enough for a small unit or factory to survive an air attack. Throughout the Battle of Britain, some 850 smoke screens were used to protect 28 critical sites and small units, none of which suffered damage from bombing during the smoke's cover.

Britain's Air Warfare Analysis Unit compared the survival rates of specific targets that camouflaged their sites versus those that did not. In a majority of the cases, bombing raids from greater than 6000 feet did not attack camouflaged sites. However, when a site failed to camouflage, it usually met a fate similar to that of the Parnall aircraft factory at Yate. It was totally destroyed.[3]

Low-level bombing attacks (approximately 1000 feet) typically overcame efforts to camouflage sites. Bomber crews' experience in low-level attacks showed that camouflage seen directly from above was not effective, as the target could be easily identified from adjacent landmarks. It was during such attacks that decoys proved to be useful. They were used to simulate the appearance of vital targets and divert the bombing attack from the real sites.[4]

Colonel J. F. Turner, of the Royal Air Ministry, organized about 100 day and night dummy airfields and erected about 400 dummy aircraft to attract the attention of Luftwaffe bombers. Dummy aircraft became so sophisticated that they could be rolled up and put into a bag and quickly erected when needed. Turner stated that his decoys had saved hundreds of lives and vital war production facilities. For example, on August 4, 1940, the building and aircraft decoys for Wolverhampton's Boulton & Paul, makers of the Defiant fighter aircraft, were heavily bombed by three waves of aircraft. The real factory survived the attack relatively unscathed.

News of the successful employment of decoys at airfields and factories quickly spread throughout Britain. Towns soon demanded the same added protection that camouflage alone could not provide. Colonel Turner developed some 140 town decoys, known as Starfish, to meet that demand. Starfish consisted primarily of a series dummy buildings, lights, and fuel oil fires that were positioned five to ten miles from the towns which the decoys protected.

Although the units that operated the Starfish were small detachments of twenty-five men, their efforts enhanced not only their own survival but the survival of thousands of British citizens. The Starfish at Bristol was the first town decoy put into operation. On the night of December 2, 1940, the Bristol Starfish attracted eighty bombs while Bristol sustained no casualties to the civilian population. Following Bristol, the towns of Sheffield, Birmingham, Duley, and Crewer emplaced Starfish of their own and met with similar success.[5]

Britain's victory was a narrow one. During the critical months of August and September 1940, Britain had lost a quarter of its air force and losses had exceeded aircraft production. The RAF lost approximately 832 fighters, the Luftwaffe only 668. Had the Germans realized the extent of their success, they could possibly have dealt Britain a crippling defeat. But, Hitler was impatient and ignorant of his success. His decision to attack Britain's populace cost him nearly 600 German bombers which tilted the battle in Britain's favor.[6]

With such a narrow victory, virtually every factor that contributed to success in the Battle was potentially decisive. Without the benefit of decoys, Britain would have likely lost considerably more aircraft through more accurate Luftwaffe attacks on airfields and factories. The will of Britain's citizens may well have been broken if the Luftwaffe had not been distracted by the Starfish, and many theorists would have likely concluded that air power would dominate all warfare.

Battle of El Alamein

The North African campaign which followed the Battle of Britain offers many examples of deception such as the famous "going map" that fooled German General Erwin Rommel into maneuvering his forces into an area of very soft sand. Operation Bertram

was the name of the deception plan for the Battle of El Alamein. Deception measures for this battle were on a scale not previously attempted in British history and made extensive use of visual decoys.

As early as September 6, 1940, Churchill became aware of an impending campaign in North Africa. The German Navy's Admiral Raeder issued a prophetic warning concerning Germany's interest in the Mediterranean Theater. Its rich oil fields tempted the Axis powers. Control of the Suez Canal meant the difference between a direct route to the Indian Ocean and a forty-five day, 15,000 mile journey around the Cape of Good Hope. If Germany were to assist the Italians in North Africa, the seizure of the Suez Canal might easily be accomplished with further rich prizes lying beyond in Palestine, Syria, and Turkey.[7]

In January 1942, Rommel began his second offensive and again and drove the British back to defensive positions at El Alamein. After this defeat, Churchill gave the Eighth Army command to Lieutenant General Bernard Montgomery. Montgomery successfully defended the El Alamein position from August to September 1942. By mid-October, he was ready to take the offensive and complete the Battle of El Alamein. Montgomery attacked Rommel's forces on October 23, 1942. After ten days of heavy fighting, the Eighth Army broke through Rommel's defenses and forced him to retreat towards Tunisia.[8]

The front at El Alamein stretched 40 miles from the Mediterranean Sea to the impassable sea of sand called the Qattara Depression. The most practical way for the British Eighth Army to attack was a frontal assault in the northern German sector. Rommel was aware of this. Montgomery would attack in the north, but he wanted to conceal the preparations there and suggest instead that the attack would come from the South.[9] Deception would help him do just that.

This was quite a challenge for the Eighth Army's deception planners, because this was not a preconceived notion of Rommel's that could be easily reinforced. Also, the desert around El Alamein was a plain of hard sand, stone outcroppings, and scrubs that make surveillance a rather simple affair. General Montgomery appreciated these limitations. Later, he wrote, "Strategic surprise was not possible. I therefore planned for tactical surprise."[10]

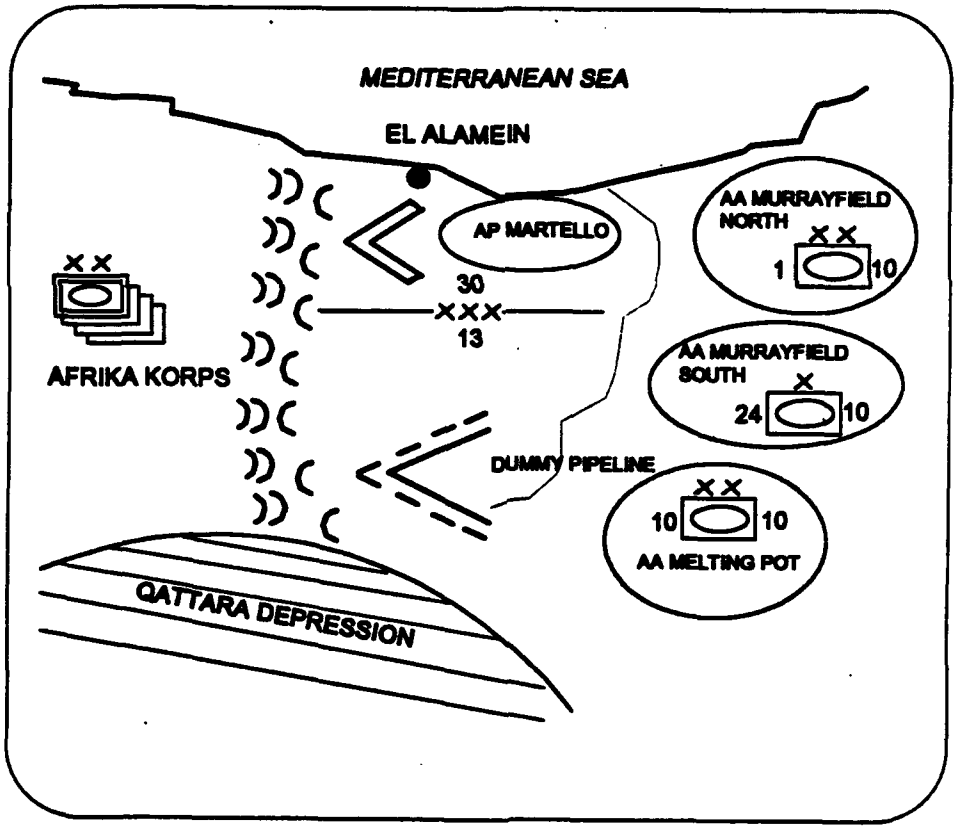

Figure 2. Operation Bertram and the Battle of El Alamein

The Eighth Army's tactical deceptions were orchestrated by the deception plan code named Operation Bertram. As depicted in Figure 2, the objective of the deception plan was to cause Rommel to split his forces in response to convincing evidence that the British were preparing their main attack some twenty miles farther south of the true ation. The manpower involved in Operation Bertram totaled 2,275 soldiers. Between them, they disguised 5000 tons of supplies in the north and displayed 8000 tons of dummy supplies and emplaced 4,500 dummy or damaged vehicles in the south.[11]

The open desert made it impossible to hide the dense concentration of vehicles in the three assembly areas: 1st Armoured Division in Assembly Area (AA) Murrayfield North, 24th Armoured Brigade in AA Murrayfield South, and 10th Armoured Division in AA Melting Pot. However, an ingenious combination of decoys and disguises did allow these units to conceal their true dispositions and portray false ones. In the north, Eighth Army combat vehicles were disguised as harmless supply vehicles while decoys were used in the south to portray a massive armored threat.

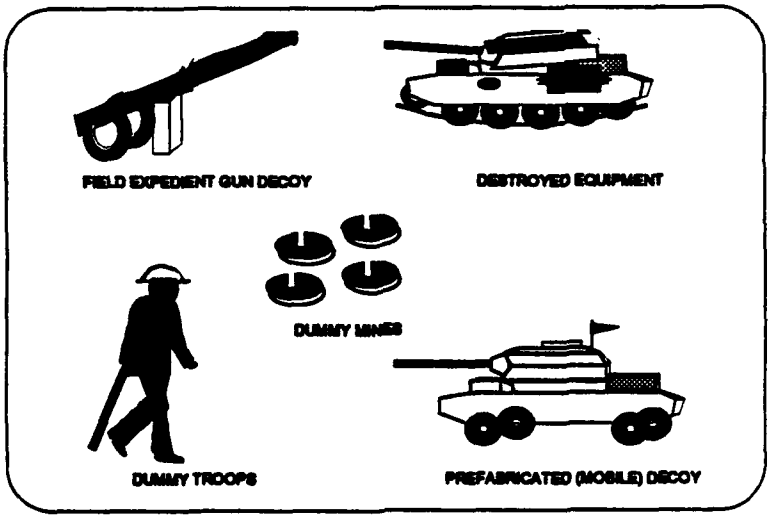

Figure 3. Decoys of El Alamein

The decoys employed by the British took several forms as portrayed in Figure 3. Some were rather crude such as a set of old tires and a log propped up to simulate an artillery piece. Damaged and unserviceable vehicles were plentiful in North Africa and also made excellent decoys. With minor cosmetic repair, a destroyed tank could provide a convincing threat to even the closest observer. Most of the prefabricated decoys were made of wood and some of these prefabricated decoys were even mobile. All the mobile decoys were built on truck chassis and simulated tanks. Other decoys simulated mines, buildings, and even troops. These decoys were often used to simulate logistics facilities.

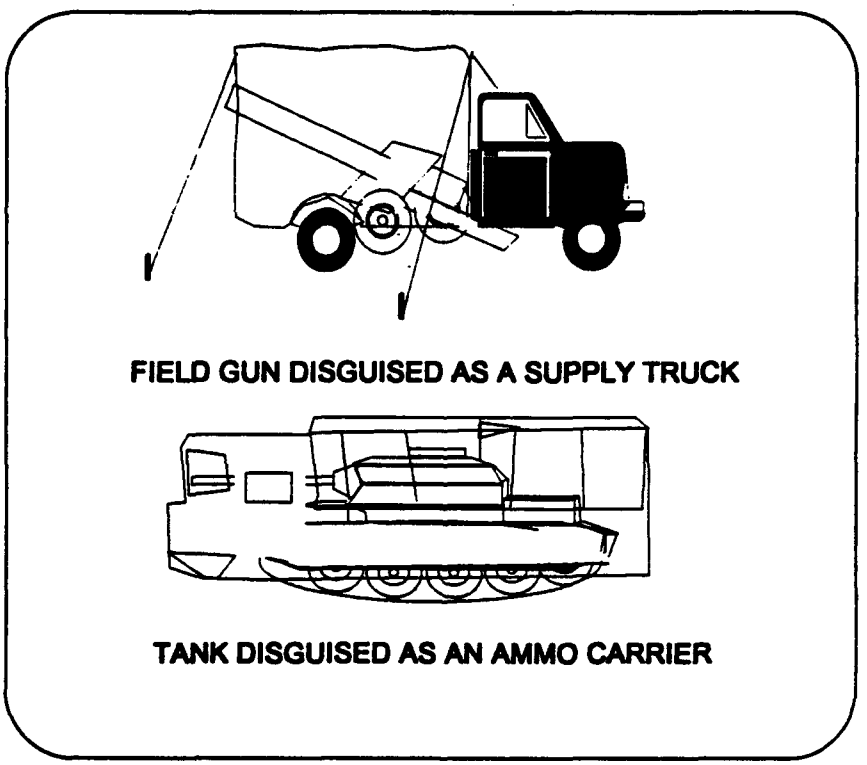

Figure 4. Disguises

Disguise was a novel adaptation of camouflage to the open desert. Since concealing combat vehicles from enemy observation was such an exhaustive task, the British often disguised combat vehicles as supply-type vehicles instead. Figure 4 presents two common examples of disguise that were used in the Battle of El Alamein. In the 30th Corps zone, the 85th Camouflage Company disguised about 400 25-pound field guns as harmless supply trucks until the moment of the attack. At that time, the gun crews simply pulled off the disguises and opened fire. Disguises for artillery were typically canvas tents that were shaped and painted to resemble a 3-ton supply truck. A canvas hood, configured to resemble an ammo carrier, was often draped over tanks to disguise them.[12]

To reinforce the story that the British main attack would come from the south, the 85th Camouflage Company employed all the available decoy types in the southern zone as a display. Work began on October 7, 1942, and was completed two days before D-Day. Three regiments of dummy tanks and artillery were emplaced. Adding to the realism of the illusion, real armored vehicles were routinely diverted to the dummy sites so that fresh tracks would appear in their vicinity.[13]

To add further credence to the display, an elaborate system of logistical simulations was also established in the south. It was rather obvious to both the Axis and Allies that an attack could not be launched from the south without a vast array of supplies. For the desert commanders, one of the most revealing signs of an impending attack would always be the laying of water pipelines. About twenty miles of dummy pipe was constructed out of four gallon petroleum cans and placed from north to south. Also, dummy storage sites, soldiers, and pump houses were built and placed along the pipeline.[14]

In Attack Position (AP) Martello, disguised positions were prepared to receive the 10th Corps units in the west and southwest. In the AAs, the 10th Corps units rested openly from October 18 to 21. These AAs were positioned along vehicle tracks that were made to simulate inordinate traffic to the 13th Corps zone. From the enemy's viewpoint,

there was a distinct danger that forces in the AAs were on their way south. However, unbeknownst to Rommel's forces, on the night of October, 21 and 22, the 1st Armoured Division, 10th Division, and the 24th Armoured Brigade moved forward to AP Martello to prepare for the Eighth Army's main attack. The units emplaced decoys as they left the AAs and erased the tracks that they made as they proceeded north. One eyewitness account describes the result of the deception as follows,

> By first light on the morning of 22nd October, a dummy stood squarely on the track marks made of every real tank, alongside the camp fire where the crews had made their last brew-up, and the pile of empty petrol cans from which they had last filled up, and whenever possible the track marks made by the real tank as it moved away [north] had been obliterated.[15]

According to captured enemy documents and statements by prisoners of war, the Axis commanders had been fooled completely. An Italian map that was marked with British positions erroneously placed the 10th Corps armored divisions in the south and made no reference to a possible threat from the area of AP Martello. Soldiers in the north reported that the enemy seemed to have known nothing until the main attack broke upon them. One captured German general stated that he had expected an attack in the south. The Panzer Army intelligence summary also predicted a main attack in the south and only a supporting attack in the north. Lastly, the fact that Rommel held back a large part of his armor in the southern sector for the first four days of the battle led the British commanders to believe that Axis forces had fallen victim to one of the most elaborate deceptions ever.

The commentary of the British Prime Minister serves as an appropriate summary of this section. After the Battle of El Alamein, Churchill reported to the House of Commons,

> While I do not want to detain the House too long, I must say one word about the third of these elements I have mentioned, a word about surprise and strategy. By a marvelous system of camouflage, complete tactical surprise was achieved in the desert. The enemy suspected -- indeed knew -- that an attack was impending, but

> when and where and how it was coming was hidden from him. The Xth Corps, which he had seen from the air exercising fifty miles in the rear, moved silently away in the night, but leaving an exact simulacrum of its tanks where it had been, and proceeded to its point of attack. The enemy suspected that the attack was impending, but did not know how, when or where, and above all he had no idea of the scale upon which he was to be assaulted.[16]

The Battle of El Alamein was over, and deception helped to secure the Allied victory.

Summary

Both World War II battles discussed in this chapter provide accounts of tactical units increasing their combat effectiveness with decoys. The Battle of Britain offers an important lesson in deception for the modern tactician concerned with the air threat. The role of decoys in an air attack is primarily one of enhancing survivability, especially at low altitudes (less than 1000 feet). At low altitudes, the enemy pilot can easily discover an attempt to conceal friendly facilities and equipment with camouflage alone; however, the addition of decoys frequently convinces the enemy pilot that the false target is real. During REFORGER 1987, an observation helicopter pilot testified that he was completely fooled by the MCCD, even after he hovered within 200 meters of the decoy.[17] This pilot was amazed that he wasted several minutes observing and reporting the decoy's position while never discovering the real tanks nearby.

During the Battle of El Alamein, decoys enhanced both the lethality and survivability of the tactical units that employed them. Decoys took many forms in the desert and still can today. Field expedient decoys may be assembled from a diversity of material readily available on the battlefield. One will likely find an abundance of damaged or destroyed equipment on the battlefield. Even modern prefabricated decoys rarely reproduce the visual signature of combat vehicles like actual damaged or destroyed combat vehicles.

By fooling the Germans into believing that the main attack would come from the south, the British 10th Corps was able to destroy the surprised Axis units in the north without interference from Axis units that were diverted to the south. At the National Training Center (NTC), a task force accomplished a similar feat. Decoys were used to simulate a false concentration of combat vehicles in one area while the main attack came from an entirely different area. This unit's success impressed the opposing force so much that the opposing force decided to employ decoys of their own.[18]

It is important to note that General Montgomery's tactical deceptions were orchestrated by the larger Eighth Army deception plan, Operation Bertram. Had tactical units conducted deception operations without regard for the higher headquarters' plans, Operation Bertram would probably have failed. The story that General Montgomery wanted to convey to the Axis would not have been supported by the disjointed events staged by the smaller units. Tactical units today should ensure that their deception plans comply with the higher commanders' intent and do not conflict with any adjacent unit's plan. Based on these historical accounts, one may conclude that the tactical employment of decoys does enhance a unit's combat effectiveness if care is taken to ensure that decoy employment complies with the higher headquarters' scheme of maneuver.

CHAPTER 4

DECEPTION AND DECOYS

A deception, no matter how simple, pays off.
Lieutenant Colonel Always, *Defense of Hill 781*[1]

Lieutenant Colonel A. Tack Always made this statement during his command in Purgatory (a.k.a., the National Training Center, NTC). Although written to entertain, Colonel McDonough's book, *The Defense of Hill 781* offers many real-life lessons for the tactician that apply to virtually any regional contingency mission as well to the NTC. Deception receives considerable acclaim in Colonel McDonough's fictitious world, but in the real world, the contributions of deception receive only honorable mention. Honorable mention often resembles this remark, "Yes, they did deception."

The purpose of this chapter is to describe the U.S. Army's current deception doctrine. The section entitled, Deception provides an explanation of current deception doctrine and of writings by authorities on the subject. The section entitled Decoys narrows the scope of this specific means of deception at the small-unit level and sets the stage for the analytical portion of this thesis. Examples from Operation Desert Storm help illustrate various aspects of deception.

> Once we had taken out his eyes, we did what could best be described as the Hail Mary play . . . a massive movement of troops all the way out to the west, to the extreme west, because we knew he was still fixed in this arena with the vast majority of his forces, ...[2]

One deceives on the battlefield in order to mislead the enemy into a predictable course of action or inaction which can be readily exploited. Deception served General

Schwarzkopf well in Operation Desert Storm. "Three sweeping allied deceptions -- two by land and one by sea -- transformed the ground war against Iraq from the 'mother of all battles' to the mother of all maneuvers."[3] Figure 5 portrays the major deceptions conducted during Operation Desert Storm.

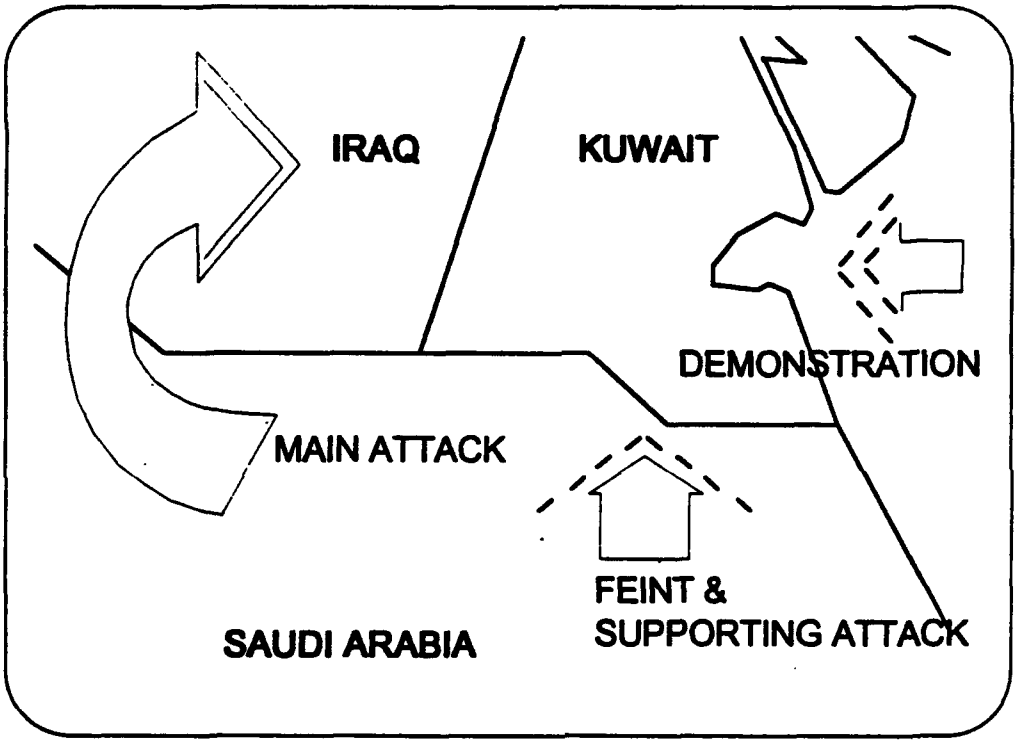

Figure 5. Coalition deceptions

The deceptions by land began early in the war when Iraqi forces outnumbered the Coalition forces 3 to 2. "U.S. and Coalition forces were concentrated and aligned opposite the enemy in Kuwait, reinforcing Iraq's belief that an attack would come over the Saudi-Kuwaiti frontier."[4] Later on decoys, false radio traffic, feints, and many aggressive

raids across the Kuwaiti border in the days before the ground offensive helped to further convince the Iraqis that their prepared defenses were properly oriented on the Coalition's main axis of attack. Once the Iraqi Air Force was out of action, Coalition forces remained undetected as they shifted to the west to envelop the Iraqis who remained fixed in their forward defense in Kuwait.[5]

Deception by sea was also an important contribution to victory. In the Persian Gulf, U.S. Naval operations convinced the Iraqis that an amphibious assault into Kuwait was impending. "U.S. battleships pounded Iraqi positions while amphibious landing rehearsals were conducted. These rehearsals tricked the Iraqi forces into remaining along the coast and allowed the allies to attack from the west."[6]

Deception

Deception comes in many forms. Many authorities distinguish two variants: A-type or ambiguity increasing and M-type or misleading. These two variants produce somewhat different effects and operate in different ways.[7] A-type deception increases the uncertainty in the enemy's mind about the true nature of a unit's operation and decreases the likelihood of successful intelligence gathering by overwhelming his sensors with contradictory indicators and a multitude of alternatives. Camouflage, smoke, electronic countermeasures, and decoys can all be employed in A-type deception. If the deceiver can ensure that the situation remains ambiguous, then the enemy commander may be forced to spread his resources too thin in order to cover all contingencies.

M-type deception attempts to convince the enemy to come to a false conclusion about the friendly course of action. What he believes is true is not. His reaction is thus more predictable and easily exploited. In this type of deception, one should follow the advice of Ewen Montagu (the famous Allied deception planner of World War II) to put yourself in the enemy commander's mind because it is much easier to reinforce his belief

than to posit a completely different falsehood that he will accept. It is what the enemy commander will think that matters. In his book, *The Man Who Never Was*, Montagu spelled out, "Therefore, if you want *him* to think such-and-such a thing, you must give him something which will make *him* (and not *you*) think it. But he may be suspicious and want confirmation; you must think out what enquiries *he* will make (not what enquiries *you* will make) and give him the answers to those enquiries so as to satisfy him."[8]

Both types of deception require the deception planner to identify the deception target and contrive a plausible story that the deception target will accept as true. The deception target is the enemy decision-maker with the authority to cause the objective of a deception to be achieved.[9] For example, if the deception objective of the battalion in Figure 6 is to cause the enemy to commit his reserve in the center sector, the target of the deception is the motorized rifle regiment (MRR) commander. He has the authority to commit the reserve. As OH 7-13 explains, "It is, of course, preferable to fool as many of the enemy as possible with deception. However, it is necessary to deceive only the individual who can make the critical decision."[10]

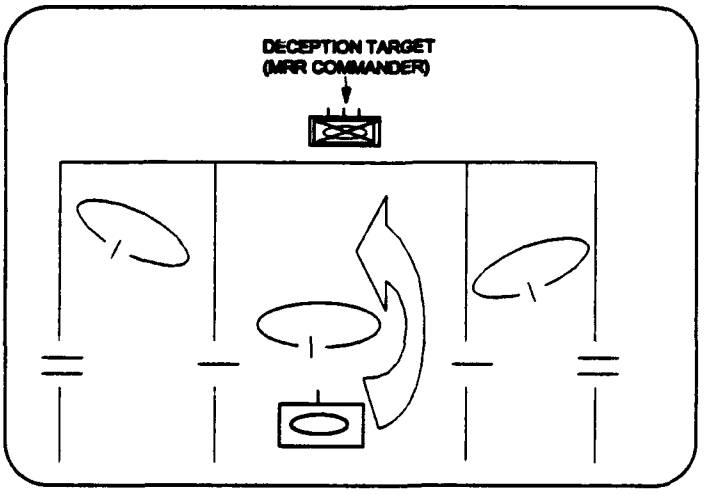

Figure 6. Identifying the deception target

The deception story is the false reality created that causes the opposing commander to incorrectly estimate the situation. It should drive him to the decision desired in the deception objective or overall goal of the deception operation.[11] The commander of the illustrated battalion may want the MRR commander to believe that the friendly center sector is weak. He may sell this story by staging credible deception events. For example, he may allow the company in the middle to delay back to subsequent battle positions sooner than the flanking companies creating the illusion of a weakness in the center sector. Overall OPSEC of the defense and concealing the reserve are also crucial to a successful deception story. Also, a feedback mechanism should be established to determine the progress and effectiveness of the deception. As with any operation, one should not continue to resource a deception that is not working.

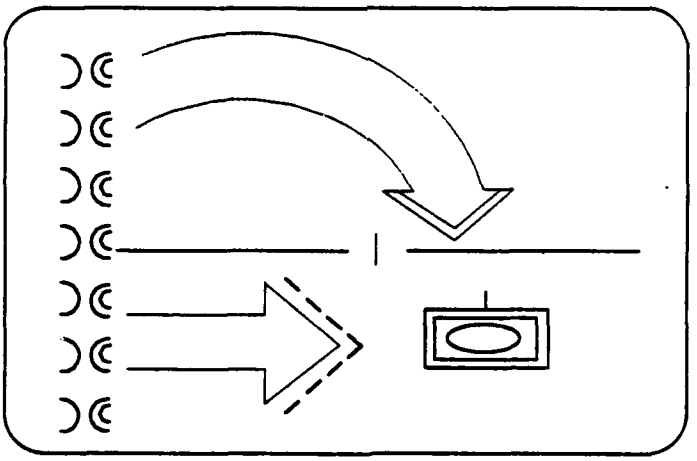

Figure 7. Feint

Deception operations generally fall into one or more of the following categories: a feint, a demonstration, a ruse, or a display. A feint, as shown in Figure 7, is a limited

objective attack that serves to divert the enemy's attention and combat forces away from the true attack. Feints may range in size from a small raid to a larger supporting attack. Often, feints are employed to cause the enemy to commit his reserve improperly, to shift his supporting fires away from the main effort, and/or to reveal the disposition of his forces. "During Operation Desert Storm, units of the 1st Cavalry Division, as part of the VII Corps, conducted feints in the Rugi pocket prior to 24 February 1991 [G-Day], to fix Iraqi frontline units and to deceive the Iraqi commanders that the coalition main attack was going to be in the Wadi al-Batin."[12]

Demonstrations aim to deceive the enemy with a show of force or an attack in an area away from the true area of operations. Figure 8 depicts a demonstration. "A demonstration differs from a feint in that no contact with the enemy is intended."[13] In

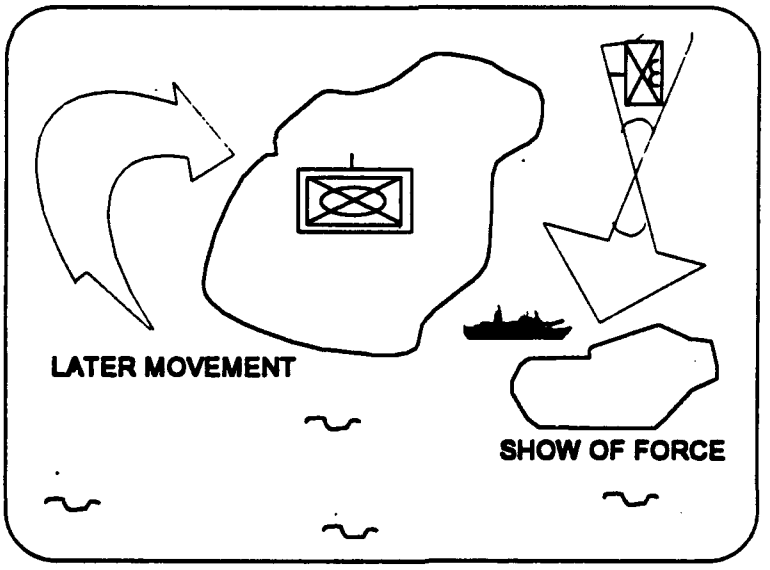

Figure 8. Demonstration

Operation Desert Storm, naval gunfire and aviation caused many historians to label all operations off the coast of Kuwait as a feint. However, since the Marine amphibious units only rehearsed the assault and never exchanged direct fire with the Iraqis, their deception was actually a demonstration.

A ruse is a trick that places false information into the enemy's hands. Misleading maps, orders, etc. may be left for the enemy in hopes of deceiving him. Ruses usually are deliberate actions but may be impromptu.[14] In Operation Desert Storm, radio traffic, containing false information, was as a ruse. This misleading information caused the Iraqis to believe that the Coalition forces were massing for a frontal attack.[15]

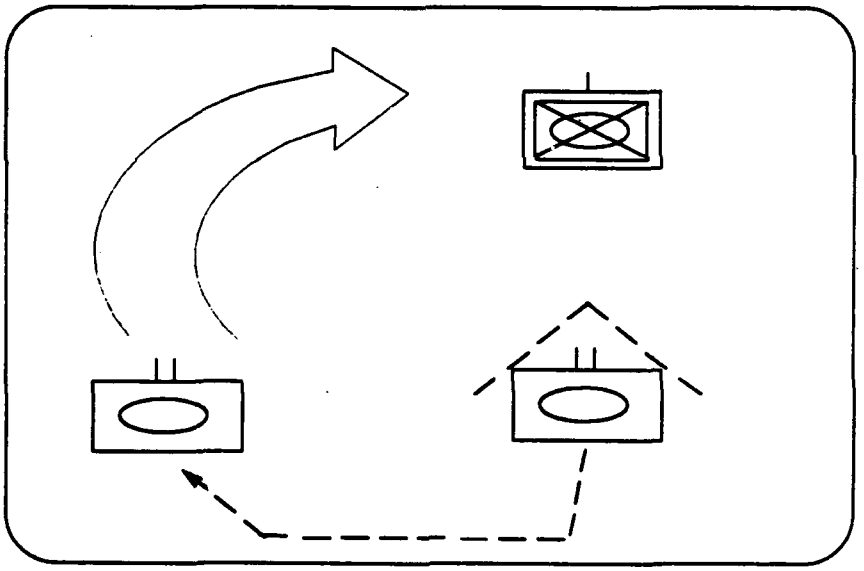

Figure 9. Display with decoys

Displays include simulations, disguises, decoys, or a combination of these to project for enemy surveillance the appearance of objects or systems that do not exist or

that appear to be something else or activities not actually taking place.[16] Figure 9 illustrates this type of deception. In this illustration, the phony battalion may only be a company or a platoon supplemented with decoys. As the enemy motorized rifle company commander focuses on the "battalion" to the south, the real battalion can proceed to outflank him. In the early days of the Gulf War, decoys were also used to further convince the Iraqi commanders that the bulk of the coalition forces were immediately across the Saudi-Kuwaiti border. The decoys helped disguise the true size, disposition, and intent of the allies.[17]

Today, many authorities on deception describe it as one of many factors that can contribute to surprise. In her analysis of deception in the Arab-Israeli Wars, Janice Stein contends, "when a challenger sets out to deceive, surprise is usually the result. It is the norm rather than the exception."[18] Colonel Michael Dewar writes in his book, *The Art of Deception in Warfare*, "Surprise can be achieved by speed of action alone, but is most usually achieved by deception. This is a theme which runs through history."[19] Indeed, the U.S. Army has adopted this premise and has included it in its doctrine. FM 100-5 states, "Surprise can be in tempo, size of force, direction or location of main effort, and timing. Deception can aid the probability of achieving surprise."[20] FM 90-2 adds, "Deception, employed properly, can help create surprise, thereby significantly enhancing the commander's opportunity for success."[21]

In addition to contributing to surprise, deception may enhance any of the other principles of war too. By excluding the other principles of war, Army doctrine promotes a rather narrow view of deception. Dr. Michael Handel, a research associate at the Harvard Center for International Affairs and prominent authority on deception, explains that the rational use of deception can be achieved in a number of ways. In his paper, entitled *Intelligence and Deception*, Dr. Handel cites two examples of when principles of war, other than surprise, may benefit from deception operations. Perhaps, a unit discovers that

they are outnumbered in their area of operation. By misdirecting the enemy's attention and causing him to concentrate his forces at the wrong place, one improves the mass of friendly forces. Another type of deception may result in the enemy violating his economy of force and enhancing one's own. This type of deception causes the enemy "to waste his resources (e.g., time ammunition, weapons, manpower, fuel) in unimportant directions or preferably on non-existent targets."[22] Creativity is the key to deception.

Clausewitz denounced deception as too costly. He contended that deception requires "a considerable expenditure of time and effort, and . . . normally they [deceptions] call for more than can be spared."[23] This may well be the case when the commander's deception plan is not coordinated with higher headquarters, is not sufficiently integrated and synchronized with the operation plan, or is not adequately concealed from the enemy. Then, not only may the invested resources be wasted, but the investment may turn out to be a detriment to the mission.

The pursuit of any combat activity contains risk and warrants an assessment of that risk before one proceeds. Such is also the case with deception. A deception, revealed for what it is, offers the enemy invaluable intelligence about the true nature of the operation. Armed with this information, the enemy may easily wrest the initiative away from an attacking force. Likewise, the enlightened enemy can easily identify weaknesses in a defending force and exploit them. One can easily imagine what could have happened if the Iraqis had discovered the deceptions conducted during the Gulf War. Surely, the Iraqi commanders would have considered reorienting their defense to the west. Perhaps, the Iraqis would have even conducted a preemptive strike into the feints conducted across the Saudi-Kuwait border. One should always weigh the potential payoff of a deception against the risks that could ensue if the execution of the deception plan goes awry.

In addition to risk analysis, a feedback mechanism is needed in battlefield deception. This will increase the likelihood of a successful deception. FM 90-2 states,

> The intelligence officer monitors the execution of the deception plan. He ensures that the deception plan is working and that the enemy is not conducting a counterdeception operation. He must determine which enemy collection assets can or cannot collect the deception story. He recommends whether or not the deception operation should be continued, modified, or terminated.[24]

The intelligence officer will likely need help in gathering this required feedback . At the battalion level, all of the principal staff should take an interest in the progress of their deception. At company and platoon level, feedback is paramount.

In summary, when commanders synchronize their operation plan and consider all the battlefield operating systems, they should not forget deception. Deception may provide the commander a relatively low-cost means to multiply combat power. In these days of downsizing, force projection, and "doing more with less," deception may very well prove to be a critical component to success in the next regional conflict.

Decoys

There are many tools available to the deception planner. Table 1 lists just a few of the common deception tools and some of their uses that one might find in a modern armored c nechanized infantry battalion. Other physical means of deception and their uses are limited only by one's imagination. These tools need not be sophisticated or prefabricated. Often, field expedient deception devices are just as effective. Smoke often conceals the maneuvering unit and confuses enemy intelligence gathering. False radio traffic may provide misleading information to the enemy or simply provide the volume of radio traffic which simulates a larger unit. Loudspeakers and lights may be combined to simulate a logistic area in order to support a larger demonstration. The last entry in Table 1 (decoys) is the deception device that is the focus of this section.

Table 1.—Sample Deception Tools

Smoke	Feints, demonstrations, and concealment
Camouflage	Concealment
Radios	Ruse-false radio traffic
Loudspeakers	Simulated unit sounds
Lights	Simulated logistic facilities
Decoys	Feints, demonstrations, and displays

Decoy Types

Decoys are generally categorized into two types as depicted in Figure 10. The first type of decoy is designed to fool enemy observers and surveillance equipment. A phony combat vehicle is an example of this kind of decoy. With such decoys, the deceiver may attempt to divert the enemy's attention and fires away from the real vehicles. The remainder of this thesis will analyze the effectiveness of this decoy type. The second type of decoy is generally associated with fighter aircraft and submarines. These decoys are geared to spoof the acquisition systems of self-propelled weapons, such as missiles and torpedoes. The word "spoof" is reserved for the action that the latter type of decoy does when it successfully diverts a guided projectile from its intended target.

Two terms are often used to describe combat vehicle mock-ups: dummies and decoys. A dummy is an imitation of something or someone on the battlefield. A decoy draws the attention of the enemy away from another area. Within the U.S. Armed Forces, only the U.S. Army's doctrine makes this distinction. "When a dummy is used to draw the

enemy's attention from some other area, it is also termed a decoy."[25] Therefore, Multispectral Close Combat Decoys are technically dummies that serve as decoys.

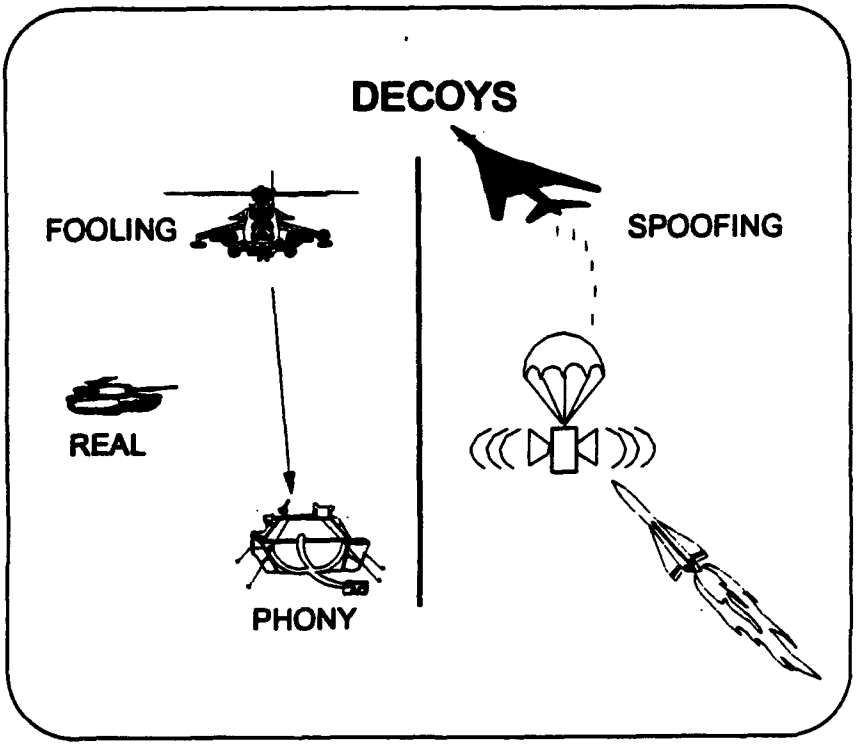

Figure 10. Decoy types

Decoy Deception Objectives

There are generally four different deception objectives that one may pursue with this form of decoy. One may wish to simply increase the survivability of an individual crew by offering the enemy an alternative decoy target. This was actually the use intended for the MCCD (Figure 11 provides an example). Here, the tank crew constructs a field expedient decoy or emplaces a prefabricated decoy in the vicinity of their fighting position.

When the enemy tank attacks, he may engage the decoy instead of the real tank depending on the preparation of the fighting position, decoy emplacement and gunnery skills of the crew. Thus, a decoy may increase the lethality of a proficient combat vehicle crew by providing it with the advantage of surprise, but will not likely enhance the surivivability of that crew if it practices poor OPSEC.

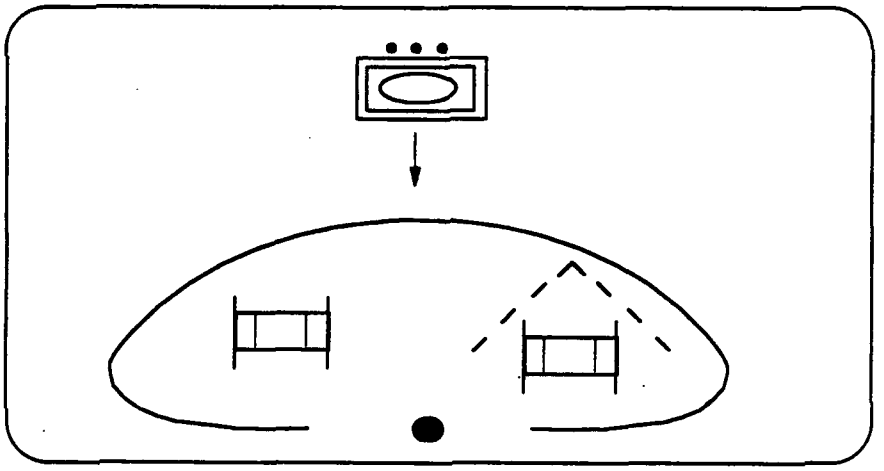

Figure 11. Enhancing crew survival

A second objective that a unit may pursue with combat vehicle decoys is fooling the enemy into thinking that there are more combat vehicles in a fighting position than there really is. Figure 12 illustrates a friendly platoon that is doing this by simulating a company. A successful feint, demonstration, or display may be conducted by simulating a larger unit. This may cause the enemy forces to respond to the perceived higher threat in a manner detrimental to his operation. For example, the enemy tank companies may stall their advance just long enough for friendly reinforcements to out flank the enemy and

destroy them. However, as always, one must not assume that the enemy will be deceived indefinitely.

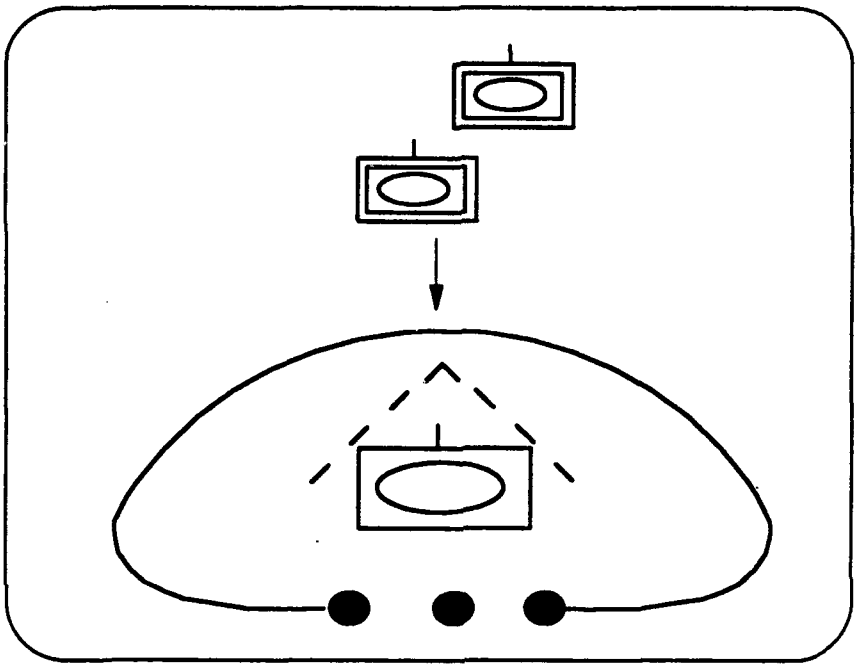

Figure 12. Simulating a larger unit

A third objective of using decoys in combat may be to disguise a future battle position as obviously false (see Figure 13). In this case, one would want the enemy to discover the decoys. If the enemy believes the deception story (that the battle position is false and always will be so), one may occupy this position at a later time (preferably under darkness) unopposed. Such unforeseen positions serve as excellent positions for both the defense and for launching offensive operations.

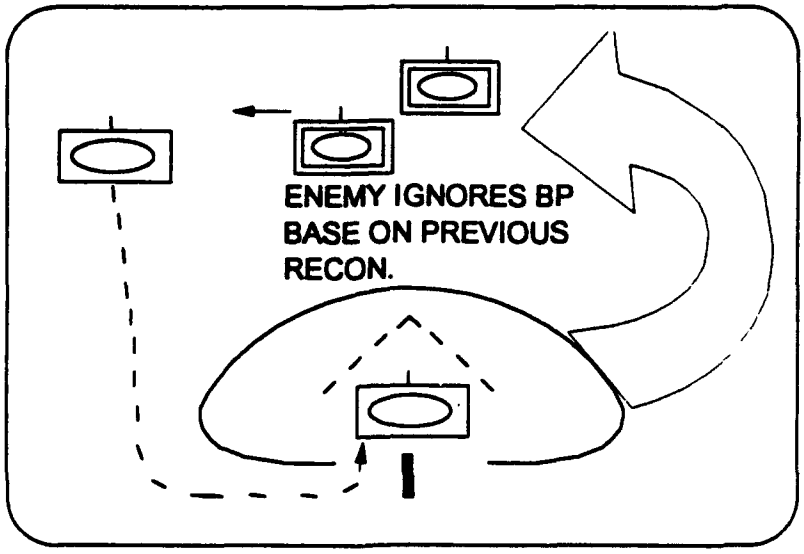

Figure 13. Occupying a false battle position

Another deception objective one might pursue is to cause the enemy to believe a false battle position is real. The decoys must be emplaced so that they are not obviously conspicuous. Realistic cover and concealment should be used at the false battle position just as one would expect to find in a real battle position. Slight breaches in OPSEC, vehicle tracks, and damaged equipment may be used to expose the position yet still appear as a genuine attempt to prepare the position for battle. Figure 14 represents the use of a false battle position in order to turn the enemy's flanks to friendly direct fire. The enemy, meanwhile, maneuvers on what he believes is the platoon's true battle position.

MCCD

The U.S. Army's first generation of combat vehicle decoys were cumbersome devices that saw limited use. Also, the appearance of the decoys were rather austere , often painted flat black or olive drab with little or no detail. One needed an air compressor to inflate the decoy's internal rubber bags. At extended ranges, these decoys

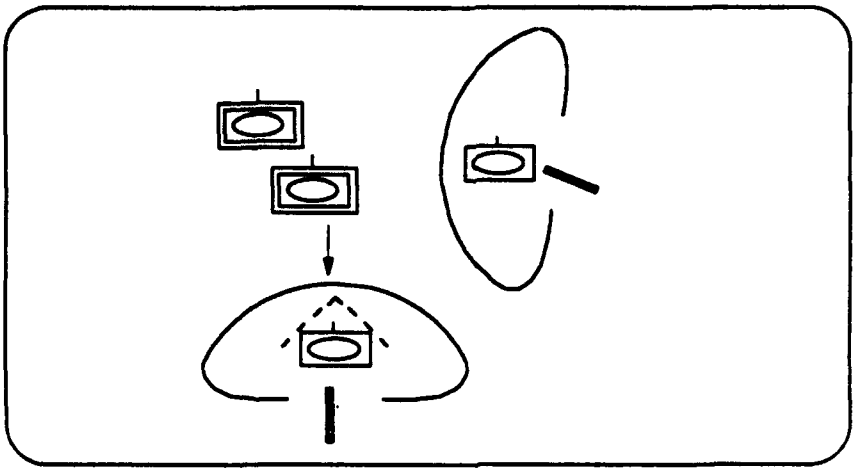

Figure 14. Turning the enemy's flank with a false battle position

would resemble actual combat vehicles; however, observers could quickly distinguish between a real vehicle and an inflatable one as they closed to within 1000 meters. Besides the excessive weight and volume, their telltale signs contributed to the inflatable decoys' unpopularity. The decoys would often sag and expand as the internal air pressure reacted to the outside air temperature. One test observer noted a highly conspicuous "gun tube droop" on the inflatable tank decoy during the cooler morning and evening hours.[26]

In the early 1980s, the U.S. Army approached TVI Corporation with an interest in upgrading the combat vehicle decoys. TVI Corporation had extensive experience in the field of thermal signature simulation and had developed numerous thermal targets for both the Army and the Air Force. Army commanders were concerned that, with the proliferation of thermal imaging systems, the first generation decoys were no longer adequate because they only presented crude visual signatures.

The Army required the decoys to be effective against an enemy equipped with thermal and visual sights at engagement ranges in excess of 500 meters, durable enough to

survive repeated deployments as well as repeated hits from anti-tank fire, and logistically acceptable (reliable, transportable, easy operation and maintenance).[27] The key lessons learned from experience with the first generation decoy was that even if they proved to work, the new decoys would be rejected if they carried too great a logistics burden.

Table 2.--Features of the MCCD

Characteristics	Capabilities
- Realistic, full scale representation of an M1 tank	- Day or night operation
- Accurate thermal signature	- Selectable thermal signature
- Accurate radar signature of an M1 tank	- All-weather operation
- Portable	- Easy set up and take down
- Lightweight	- Power supply fault lock-out
- Survivable	- Packs into two bags for storage and transport
- Simple to operate	- 8 hrs of operation on one tank of fuel
- Simple to maintain	- Two man set up in less than 5 mins./take down in 10 mins.

The result of this procurement was the fielding of approximately 1200 MCCDs. Although prototype decoys were developed in a wide range of combat vehicle types, only the M1 MCCD was fielded. The MCCD is a canvas and aluminum frame design that presents both visual and thermal enhanced images. During the concept evaluation program at Fort Knox, testers noted that the M1 MCCDs produced signatures that were

presents both visual and thermal enhanced images. During the concept evaluation program at Fort Knox, testers noted that the M1 MCCDs produced signatures that were often more realistic than the actual vehicles themselves.[28] Other features of the MCCD are listed in Table 2.

The Army insisted that the decoy be of simple design. There was to be a minimum of separate parts, and there could be no requirement for tools to assemble the decoy. The informal message that TVI Corporation received was, "If it (the decoy) doesn't fit on the bustle rack of my tanks, I don't want it." In response, TVI Corporation designed a portable, two dimensional mock-up of the M1 Abrams tank (MCCD) that two men could easily erect in about three minutes. Figure 15 depicts the MCCD and its nine components.

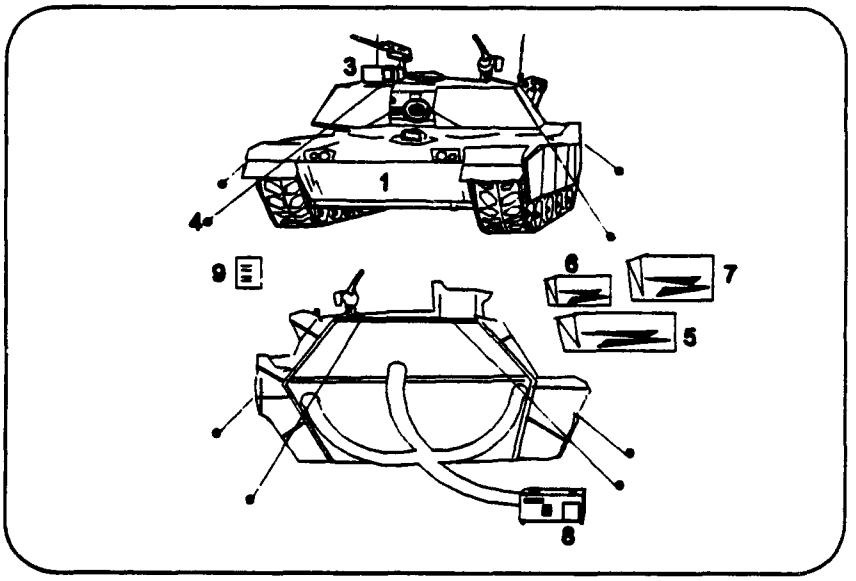

Figure 15, MCCD components

1. Decoy image assembly
2. Antenna assembly
3. Radar corner reflector assembly
4. Stake (4) and ties
5. Transportation bag for decoy set
6. Repair kit
7. Transportation bag for power supply
8. Power supply assembly
9. Instruction card

The decoy image assembly contains materials that impart both a thermal and visual signature. The 3-M "Scanamural" industrial graphics process was used to give the MCCD a high fidelity, high resolution visual image. "This unique, large format graphics system electronically paints a continuous tone full color image on flexible canvas."[29] Image material bags receive warm air from the power supply assembly to produce a signature representative of an actual M1 tank in various combat conditions (i.e., hot body/hot tracks, hot body/cold tracks, cold body/hot tracks, and cold body/cold tracks). Tubular rods of the antenna assembly simulate the real radio antenna found on a M1 tank. Stakes, that come with the decoy set, help sustain the decoy in sustained winds up to 29 m.p.h. and in wind gusts up to 46 m.p.h.[30]

Summary

This chapter provided a convenient platform for narrowing the thesis scope to visual decoys at the tactical level of war. However, no discussion of decoys would be complete without first an overview of the broader subject of deception. The section entitled Deception briefly introduced five components of deception (objective, target, story, event, and OPSEC). These components were introduced in context only. A formal

definition of each term may be found in the glossary of this thesis. Anyone who endeavors to plan a tactical deception operation should have a thorough understanding of these terms and is encouraged to study the doctrinal deception manuals of each service. The risks involved in battlefield deception are potentially large. However, the benefits to be won by properly applying the principles of deception and one's own imagination may be significantly greaater.

The categories of deception operations (feint, demonstration, ruse, and display) were illustrated and discussed separately. Good deception plans, that are integrated into the operational scheme of maneuver, would likely contain a combination of two or more categories of deception operations. Often, the terms feint, demonstration, ruse, and display are used interchangeably in contemporary writings and discussions. The importance of explaining these and other doctrinal terms to the soldiers who must carry out a deception operation can not be overstated. Conducting the wrong deception operation at the wrong time and place would likely prove fatal to the deceivers and adverse to the overall friendly operation.

The Decoys section distinguished between the visual decoy type that is analyzed in this thesis and the more sophisticated weapons-spoofing decoy employed largely by the Air Force and the Navy. The visual decoys include a diversity of dummy military equipment and even personnel. During the invasion of Normandy, the Allied Forces dropped dummy parachutists to divert the Axis Forces combat units away from the Normandy beachheads. Field expedient decoys are often just as effective as prefabricated ones. During one rotation at the NTC, a battalion cut out plastic silhouettes of combat vehicles and totally fooled the attacking opposing force with them. This battalion ultimately survived the engagement with no casualties.[31] Most battlefields have a plethora of damaged equipment which make splendid decoys. The Battle of El Alamein (discussed in the last chapter), provides several examples of successfully employing damaged

equipment as decoys. The MCCD is the U.S. Army's latest combat vehicle decoy. Although MCCDs have been used in the NTC, CMTC, and Operation Desert Storm, there are very few accounts of the MCCD's effectiveness.

Four methods of employing visual decoys were posited, in this chapter, as a means of deceiving an enemy force. There are undoubtedly other methods of employing decoys. Depending on the tactical mission, and one's imagination, effective decoy use may involve a combination of the four methods discussed or some entirely different method.

Chapter 5 provides a quantitative assessment of the combat effectiveness of visual decoys based on Janus and CASTFOREM simulations. Statistical analysis of tactical unit performance (detections, shots, and losses) and the subjective evaluations provided thus far support the conclusions and recommendations which follow in Chapter 6.

CHAPTER 5

STATISTICAL ANALYSIS

At this point, it is probably worthwhile to briefly review the thesis question. Does the tactical employment of decoys enhance combat effectiveness? Besides offering a review of current deception doctrine, the primary purpose of this thesis is assessing the combat effectiveness of the tactical employment of decoys. This assessment is both qualitative and quantitative in nature. In this study, combat effectiveness is both a measure of a unit's ability to destroy an enemy force and the ability to survive to fight again or simply, in this case, the lethality and survivability of a tactical unit that employs decoys vis-à-vis a like unit that does not employ decoys.

In this chapter, the analysis shifts from a qualitative evaluation to a quantitative assessment based on empirical data generated from two computer simulations, Janus and the Combined Arms and Task Force Evaluation Model (CASTFOREM). These simulations are TRADOC research and analysis tools that are used to select among competing weapons systems in the cost and operational effectiveness analysis (COEA) process and to examine and develop tactics and force structures for the U. S. Army.[1]

One of the most noticeable aspects of these combat simulations is their stochastic properties or lack of certainty. A set of data resulting from stochastic simulations lends itself to a statistical analysis and inference about the true nature of system behavior. Although the same set of circumstances may be run over and over, no two results will necessarily be the same. Similarly, the outcome of one experiment does not depend on the

previous experiment. In order to work constructively with such observed, uncertain processes, one needs to put them into a mathematical framework. That is the purpose of this chapter.

This chapter is composed of three sections. The first section is entitled, Janus Wargaming. It presents the results from Janus simulations that were produced by the U.S. Army Development and Employment Agency (ADEA) in 1988. These simulations were run to investigate the potential of battlefield deception equipment and techniques, including the tactical employment of decoys.[2] Friendly and enemy detections, shots, and kills measure the effectiveness of a unit with and without decoys. Also, the employment of the decoys is varied by density (real to decoy ratios of 1 : 1, 1 : 1.5, and 1 : 4) and position (forward, collocated, and rear of the unit's battle position). Following tabulation and review of the data, graphical depictions of the data are presented to help the reader to understand the statistical tests that are used to base subsequent interpretations.

Likewise, the section, entitled CASTFOREM Wargaming, presents the results of CASTFOREM simulations conducted by TRADOC Analysis Center-White Sands Missile Range (TRAC-WSMR) in 1993. TRAC-WSMR did not model varying densities of decoys in a unit, but did model the position of decoy emplacement relative to the unit's battle position. However, instead of modeling the difference between decoys forward, collocated, and rear of the unit's battle position, TRAC-WSMR's modeling compares the employment of decoys to the flank with collocating the decoys within the unit's battle position.[3]

ADEA and TRAC-WSMR modeled a variety of deception techniques, deception equipment, and tactical scenarios. For the sake of consistency, only the force structure, deception equipment, and scenario that are common to both the Janus gaming and the CASTFOREM gaming will be analyzed in this chapter. Both ADEA and TRAC-WSMR wargamed an American armored task force defending against a Soviet-style tank regiment

in Central Europe. Also, in both instances, the lethality and survivability of the assigned tank companies were measured with and without the benefit of decoys (MCCDs).

In the Summary, a review of both Janus and CASTFOREM wargaming results and the statistical inferences that may be made based on the results is presented. The conclusion of this section, marks the end of the analysis of decoys at the tactical level of war.

Janus Gaming

This section is divided into two subsections, Results and Statistical Tests. Initially, the results of the simulations are presented in tabular form to serve as a reference supporting the graphical depictions and statistical tests which follow. Graphs of the tabulated data are then provided as a precursor to the tests of hypotheses which follow.

Statistical inference is based on a sample from the population of all items under investigation. In this case, the population contains an infinite number of observations that may be generated by running a particular computer simulation. The forty-one runs from each Janus simulation represent the sample or subset of the population. Based on the sample, one may describe a population parameter (such as the mean, standard deviation, etc.) or one may decide whether or not to reject a hypothesized statement about the population. The latter is applicable to this chapter and in describing the effectiveness of the tactical employment of decoys based on sample data.

ADEA's Janus wargaming was conducted in order to investigate the potential of battlefield deception techniques and equipment to enhance survivability and lethality of U.S. Army tactical units. The impact of decoys was measured by using decoys in various densities and different deployments. The results of adding decoys to the force are expressed in terms of number of detections, total number of shots fired (at real tanks and decoys), and number of losses. Forty-one repetitions of e[illegible]sity and deployment

configuration were run to obtain an arithmetic mean of the performance measure (detections, shots, and kills).

Tank decoys were modeled as exposed systems with approximately 75 percent of the system visible to the enemy. At least six hits from direct fire were required before a decoy would be considered destroyed or recognized as a decoy by the engager. As with the currently fielded MCCDs, the tank decoys were not modeled with pyrotechnic enhancements. Enemy units could fire at decoys from between 500 meters and the maximum range of their weapon. When the enemy closed to within 500 meters of the decoy, it was considered compromised and the decoy was removed from further simulation.[4]

Results

Table 3 contains the results of the Janus wargaming of an American armored task force in Central Europe. In the initial investigation, a base case armored task force (the two tank companies were equipped with 28 tanks) was compared with a like task force equipped with decoys (28 decoys are deployed in no particular deployment configuration). The second set of data demonstrates the effectiveness of varying densities of decoys (again, no particular deployment configuration was modeled). Lastly, the effect of varying the deployment of decoys (i.e., forward, collocated, and rear of the battle position) is represented by the last set of data.

Table 3.--Janus wargaming results

No Decoys vs Decoys		
Detections	No Decoys	Decoys
Friend (by M1 tanks)	394.8	505.6
Foe (of M1 tanks)	68.6	66.0
Shots		
Friend (by M1 tanks)	191.0	221.0
Foe (at M1 tanks)	62.8	63.4
Losses		
Friend (M1 tanks killed)	16.4	13.4
Foe (enemy CVs killed)	57.0	59.6

Densities			
Detections	1 : 1	1 : 1.5	1 : 4
Friend (by M1 tanks)	479.3	499.0	467.3
Foe (of M1 tanks)	105.8	77.0	92.5
Shots			
Friend (by M1 tanks)	163.0	158.0	186.0
Foe (at M1 tanks)	55.3	52.3	76.0
Losses			
Friend (M1 tanks killed)	23.0	22.8	30.0
Foe (enemy CVs killed)	69.3	69.0	64.5

Deployment			
Detections	Collocated	Forward	Rear
Friend (by M1 tanks)	416.5	479.3	434.2
Foe (of M1 tanks)	73.0	105.8	68.2
Shots			
Friend (by M1 tanks)	122.8	163.0	144.0
Foe (at M1 tanks)	41.3	55.3	46.6
Losses			
Friend (M1 tanks killed)	24.0	23.0	21.6
Foe (enemy CVs killed)	64.3	69.3	66.8

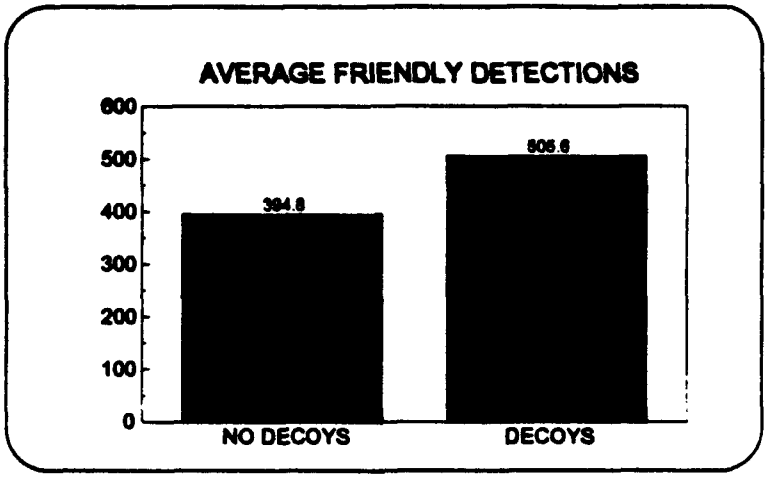

Figure 16. Average friendly detections (no decoys vs decoys)

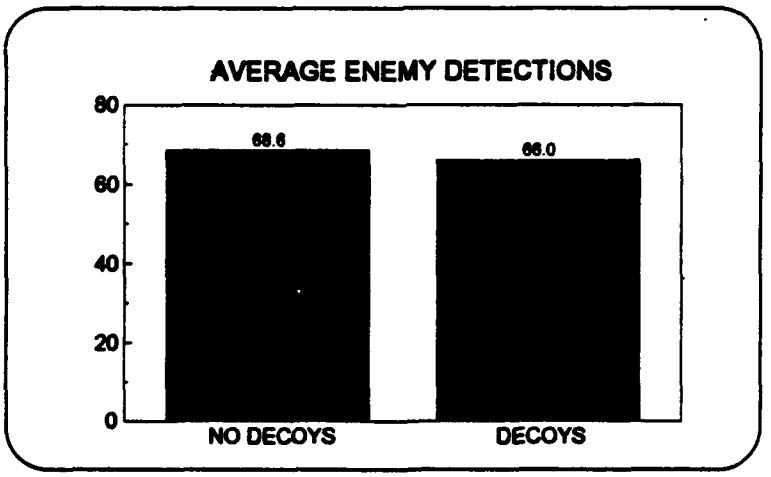

Figure 17. Average enemy detections (no decoys vs decoys)

The graph of the average detections in Figure 16 shows that when decoys were employed by the defending tank companies, the number of enemy combat vehicles that the friendly force detected increased by 110. This indicates that the enemy force may have been fooled by the friendly use of decoys , and consequently, the enemy exposed himself more than the average. The employment of decoys doesn't seem to have significantly affected the enemy detections of friendly tanks (portrayed in Figure 17). However, according to the original Janus report, the enemy's detections did tend to surge late in the battle. Statistical tests will ascertain whether or not the difference in observed detections is significant.

The presence of friendly decoys apparently caused the friendly tank companies to fire at the increased presence of enemy combat vehicles (CVs). Figure 18 illustrates this trend. On the other hand, Figure 19 suggests that the mere presence of decoys did not cause the enemy to fire any more rounds than usual.

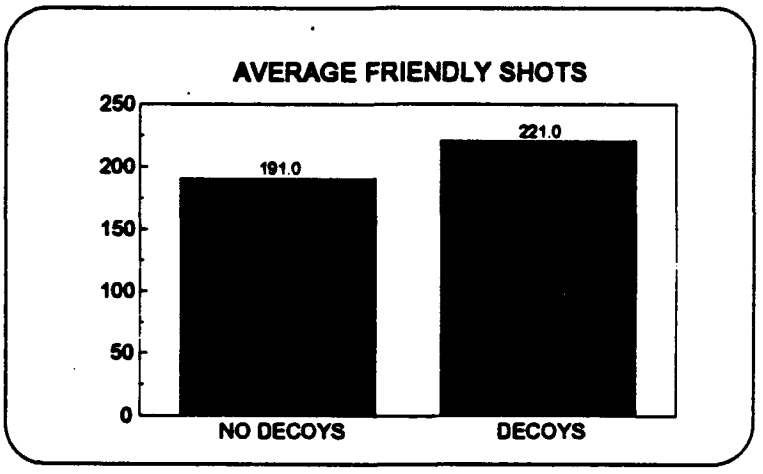

Figure 18. Average friendly shots (no decoys vs decoys)

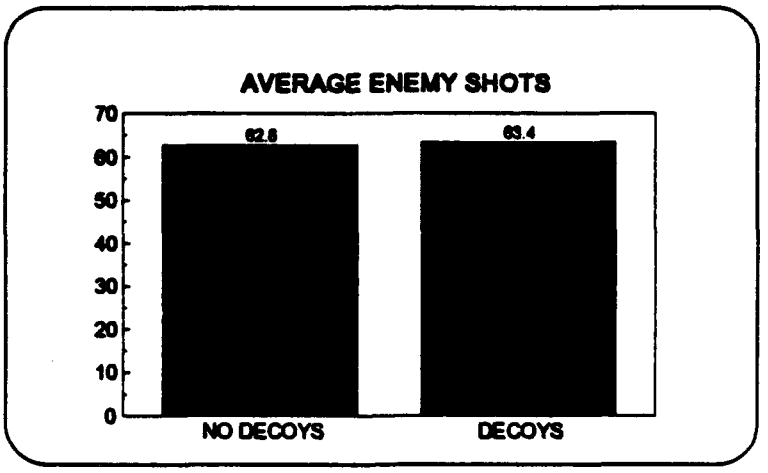

Figure 19. Average enemy shots (no decoys vs decoys)

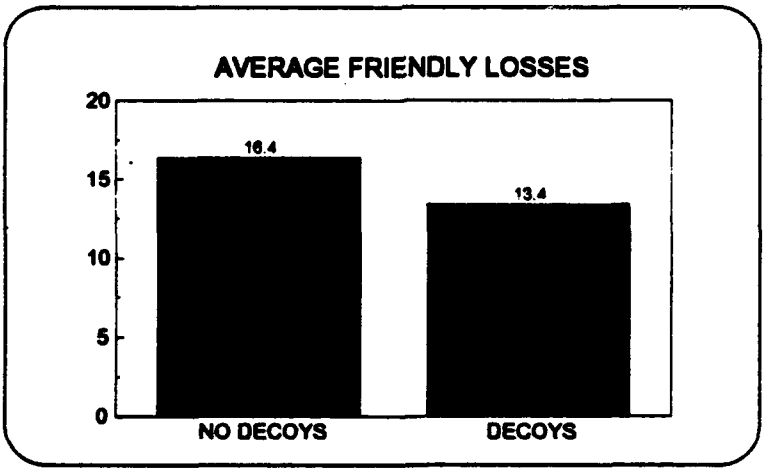

Figure 20. Average friendly losses (no decoys vs decoys)

The friendly and enemy lossess, depicted in Figures 20 and 21, indicate that when decoys were employed by the friendly units, their lethality and survivability increased. In fact, in this scenario, the friendly units equipped with decoys killed more (+ 2) and lost fewer (- 3) than the average. The employment of decoys gave this friendly tactical unit an edge in battle. Statistical tests will confirm or impugn this subjective assessment.

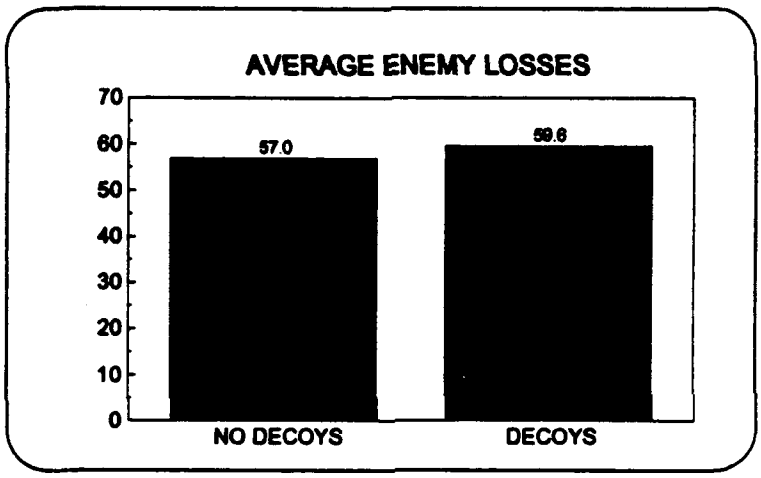

Figure 21. Average enemy losses (no decoys vs decoys)

Figures 22 and 23 represent the different average detections that resulted when the density of decoys was changed. The base case was a tank company that employed fourteen decoys (one per tank). When the use of decoys were increased to three decoys per two tanks (1: 1.5), the number of friendly detections went up. However, when the number of decoys increased to four decoys per tank (1 : 4), the number of friendly detections went down. This suggests that the enemy became aware of the decoys sooner and effectively maneuvered his force to avoid exposing himself. The enemy detections of

the friendly M1 tanks supports this conjecture. When the ratio of friendly tanks to decoys was decreased to 1 : 1.5, the battle favored the friendly unit. But, when the ratio was decreased to 1 : 4, the enemy detected more friendly tanks.

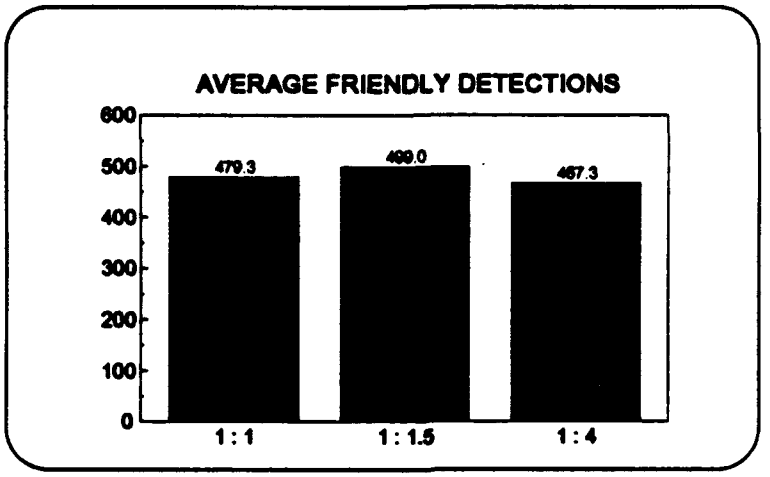

Figure 22. Average friendly detections (densities)

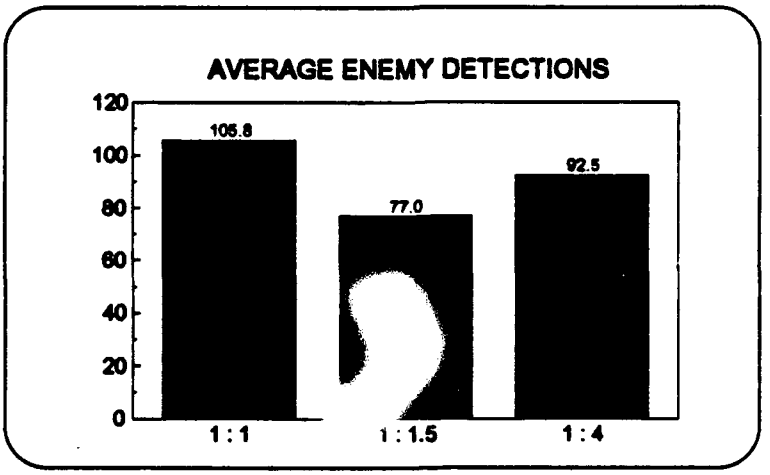

Figure 23. Average enemy detections (densities)

The average number of shots fired at the enemy force seems to decrease with the 1 : 1.5 ratio of tanks to decoys, but increase with the ratio 1 : 4. Figure 24 illustrates this tendency. As depicted in Figure 25, the shots fired by the enemy at M1 tanks seems to behave in much the same manner. Again, the data suggest that it is possible to employ too many decoys in combat.

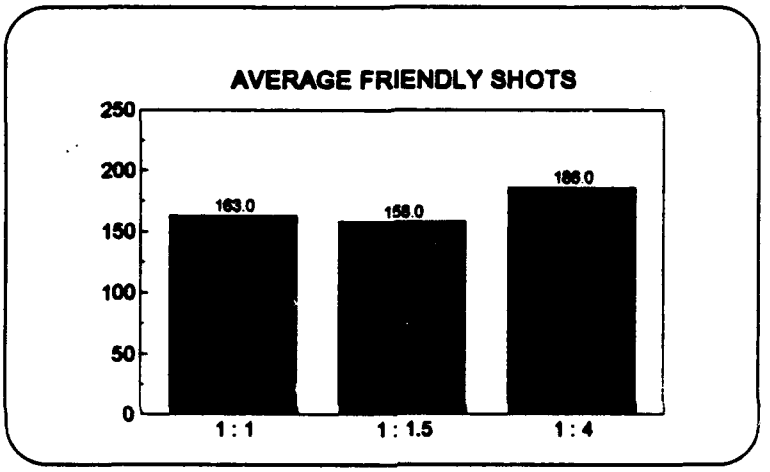

Figure 24. Average friendly shots (densities)

Figures 26 and 27 illustrate the effect the different densities of decoys have on friendly and enemy losses. The effect is similar to the ones observed in the average numbers of detections and shots. As the ratio of tanks to decoys decreased to 1 : 1.5, the M1 tank losses went down, and when the ratio decreased to 1 : 4, the friendly losses went up. Figure 27 shows that enemy losses remain unaffected by the change in ratio until the ratio is decreased to 1 : 4. Then the enemy loses fewer combat vehicles.

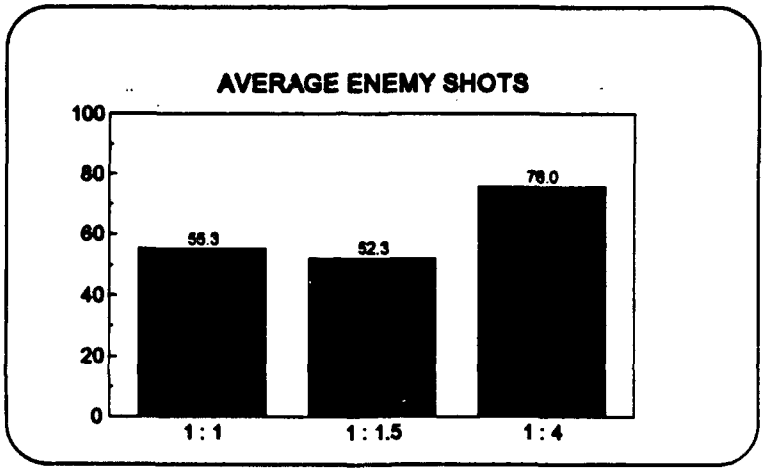

Figure 25. Average enemy shots (densities)

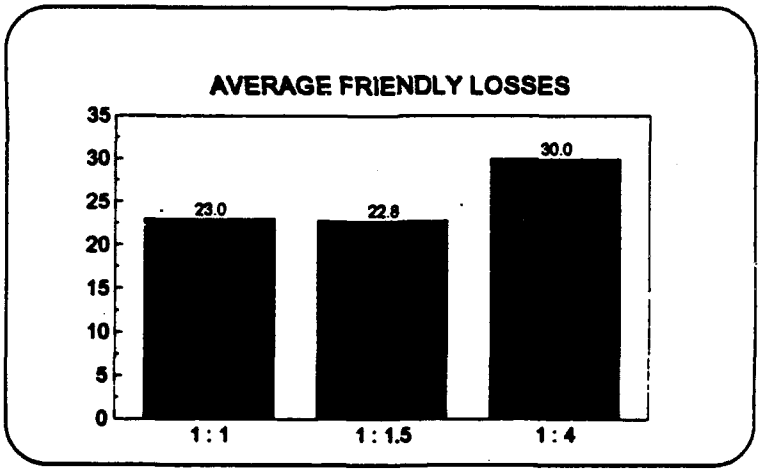

Figure 26. Average friendly losses (densities)

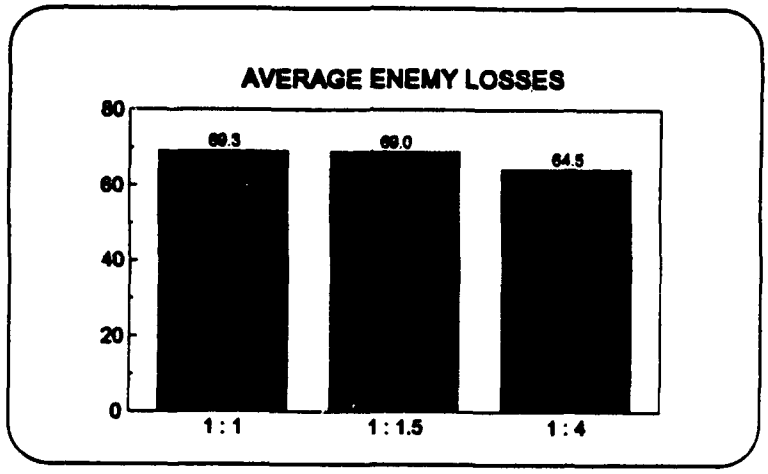

Figure 27. Average enemy losses (densities)

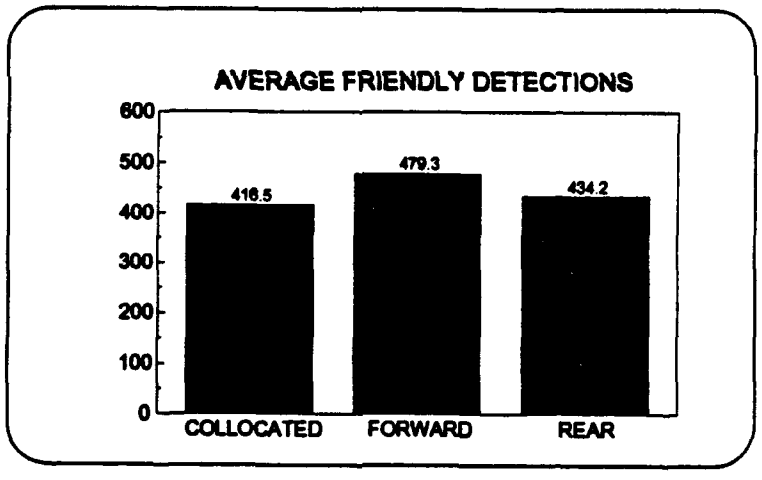

Figure 28. Average friendly detections (deployment)

Figures 28 and 29 show the effect of varying the deployment of decoys. One may collocate them in the unit's battle position, place them out forward of the battle position,

or one may place them to the rear of the battle position (in CASTFOREM gaming, the effect of emplacing decoys to the flank is also examined). When the decoys are collocated in the friendly battle position, the average number of detections is at its lowest. The highest number of detections by friendly units occurred when the decoys were placed forward of the battle position; whereas, placing the decoys to the rear offered only a slight improvement in detections. The enemy finds more friendly tanks when the decoys are placed forward of the battle position. The least M1 tanks were found when the decoys were placed to the rear of the battle position. This also suggests that decoys may actually serve to alert the enemy of impending danger if one does not employ decoys in a thoughtful manner.

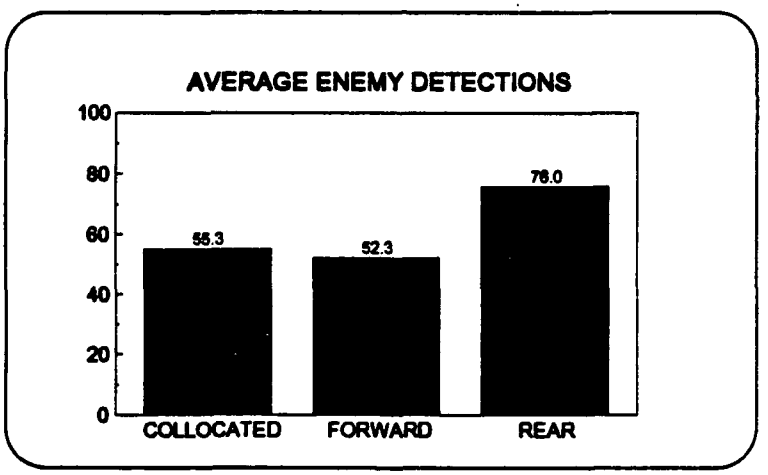

Figure 29. Average enemy detections (deployment)

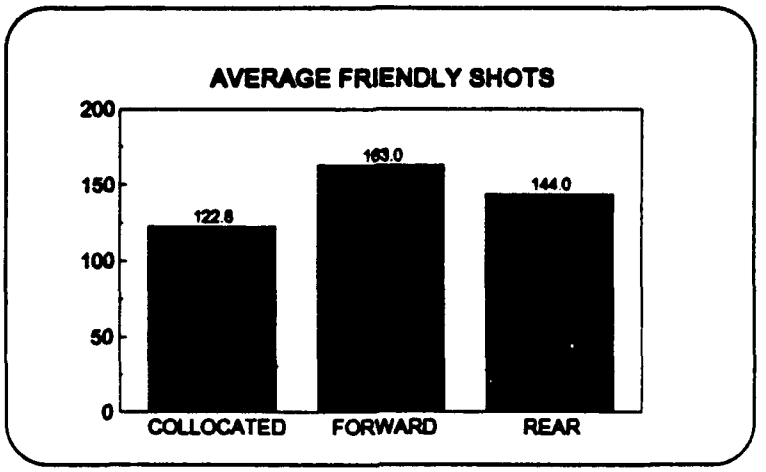

Figure 30. Average friendly shots (deployment)

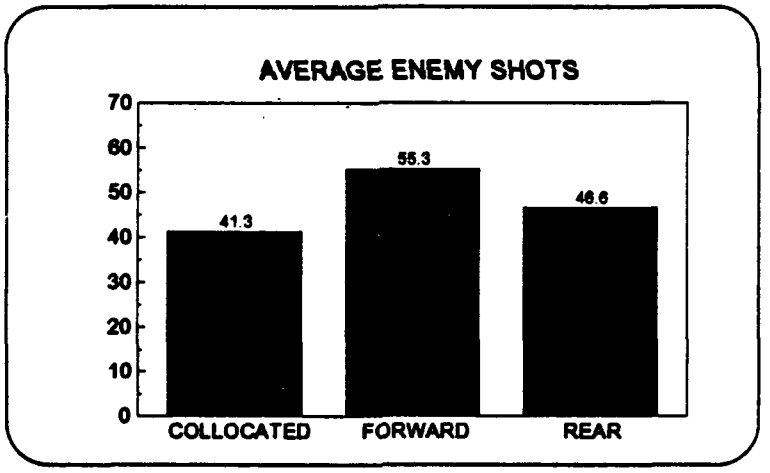

Figure 31. Average enemy shots (deployment)

The effect that varying the deployment of decoys has on the average number of shots is portrayed in Figures 30 and 31. Here one can see that the shots fired by the

friendly force are greatest when the position of the decoys is forward of the battle position and placing the decoys to the rear offers slight improvement over collocating the decoys. Apparently, one takes a considerable risk by placing decoys out front. Not only did the friendly force identify and engage more enemy, but the enemy also identified and engaged more friendly when the decoys were placed forward of the battle position.

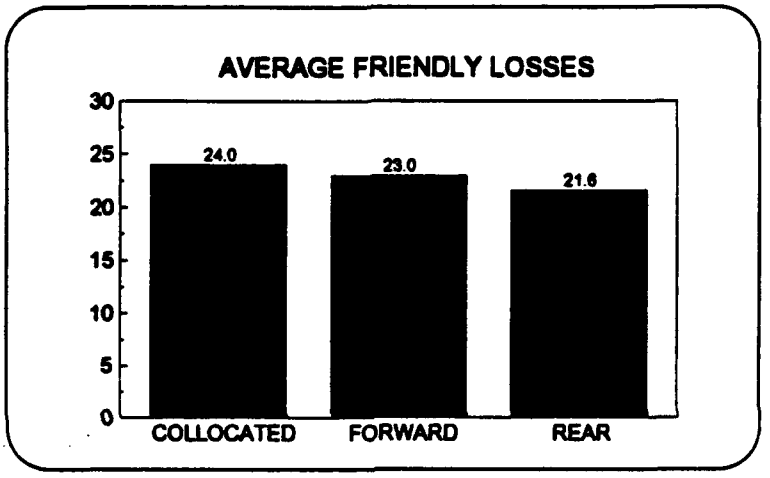

Figure 32. Average friendly losses (deployment)

Figures 32 and 33 compare the kills recorded when the deployment of decoys is varied. One might expect (given the increased detections and shots fired) for the average number of enemy losses to also increase as the decoys are emplaced forward and rear of the battle position. This did happen in the simulations to some extent. The friendly tank companies' ability to kill the enemy increased as the decoy position was varied (Figure 33). Conversely, the enemy force found it more difficuly to kill the friendly tanks when the decoys were placed forward and rear of the battle position (Figure 32). Decoys may

actually telegraph the friendly position and intent if they are not used in a prudent manner. Based on the Janus simulations, treating the decoys as an obstacle (observing the decoys positioned away from the battle position with direct and indirect fire) is preferred to emplacing decoys within the battle position.

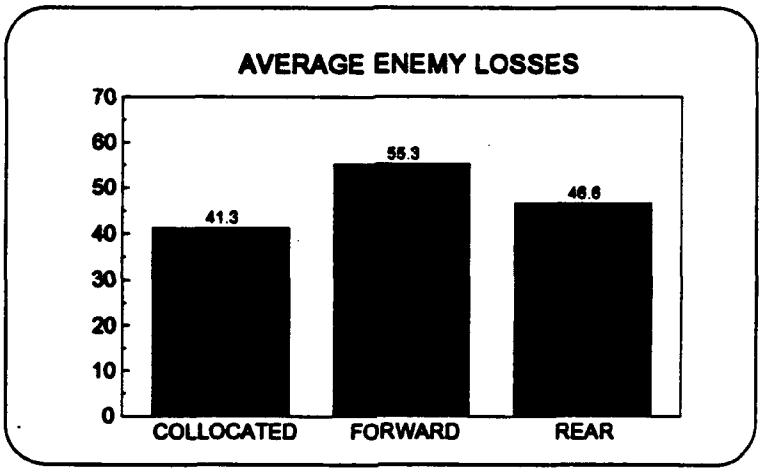

Figure 33. Average enemy losses (deployment)

Statistical Tests

The discussions in the last subsection were not based on any mathematical principles; therefore, the comparisons and resulting interpretations were hypothetical at best. In this subsection, evidence from the random samples of simulations will be used to test the hypothesized statements about the different decoy configurations to determine whether the observations are statistically significant or not. It must be made clear at this point that the acceptance of a statistical hypothesis is a result of insufficient evidence to reject it and does not necessarily imply that it is true (i.e., one fails to reject the

reject it and does not necessarily imply that it is true (i.e., one fails to reject the hypothesis).

The Janus wargaming involved two samples of forty-one runs each and the results were reported as sample mean values. The raw data resulting from these runs is no longer available and limits the scope of statistical testing to testing of the reported means. In this case, a two-tailed test of means will be used to ascertain whether the means of two different simulations (populations of various decoy configurations) are equal. For example, one hypothesis that must be tested states that the average number of friendly losses is not significantly affected by the tactical employment of decoys. This statement is called the null hypothesis (H_o). Rejection of the null hypothesis causes one to conclude that the alternative hypothesis (H_1) is true. In this example, the alternative hypothesis states that the tactical employment of decoys produces a significant difference in the average number of friendly kills. If evidence fails to support a rejection of the null hypothesis, then there is not enough evidence to conclude that the tactical employment of decoys significantly affects friendly kills of enemy combat vehicles. In other words, one fails to reject the null hypothesis.[5]

After establishing the null and alternative hypotheses and selecting a test statistic (the mean detections, shots or kills), one must choose a level of significance, α. In this study the preselected α is 0.05. This value is the probability of accepting a false hypothesis (Type I error).

Next, one must choose a set of possible test statistic values such that the value of the test statistic will fall in the rejection region which is α. The critical region (shaded region in Figure 34) is then all the numbers greater than or less than the critical value (Z score for $\alpha_{/2}$). The critical region and test statistic are expressed in terms of Z values by means of the transfc..nation

$$Z = \frac{\bar{x} - \mu_0}{s\sqrt{n}}$$

where $\bar{x}$ = the arithmetic mean of detections, shots, or kills of a specific Janus simulation, μ_0 = the hypothesized mean, s = the sample standard deviation, and n = the sample size (in this case 41 for each sample or simulation). Figure 34 depicts the critical region of the standard normal curve involved in testing the different Janus wargaming decoy configurations. Any test statistic with a Z value less than $-Z_{\alpha/2}$ or greater than $+Z_{\alpha/2}$ falls in the critical region and supports a rejection of the null hypothesis.

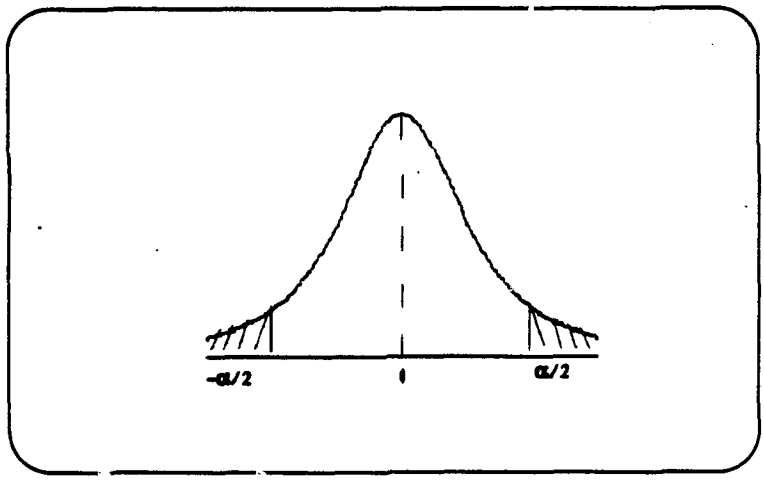

Figure 34. Critical region for Janus hypothesis tests

Table 4 lists the results of the statistical testing of each Janus decoy configuration and simulation. The formal hypothesis and alternative hypothesis tested in each case was

$$H_0 : \mu_1 - \mu_2 = d_0$$

$$H_1 : \mu_1 - \mu_2 \neq d_0$$

where d_0 = the hypothesized difference between the two population means. In this case, the hypothesized difference is zero.

Table 4.--Statistical tests of Janus decoy configurations

No decoys vs decoys							
Detections	NoDecoys	s	Decoys	s	Z	$Z_{\alpha/2}$	Decision
Friend	394.8	62.7	505.6	80.2	-12.5	±1.96	Reject
Foe	68.6	10.9	66.0	10.5	1.7	±1.96	Fail to reject
Shots							Decision
Friend	191.0	30.3	221.0	35.1	-7.0	±1.96	Reject
Foe	62.8	10.0	63.4	10.1	-0.4	±1.96	Fail to reject
Losses							Decision
Friend	16.4	2.6	13.4	2.1	8.2	±1.96	Reject
Foe	57.0	9.0	59.6	9.5	-2.0	±1.96	Reject

Densities							
Detections	1 : 1	s	1 : 1.5	s	Z	$Z_{\alpha/2}$	Decision
Friend	479.3	76.1	499.0	79.2	-1.8	±1.96	Fail to reject
Foe	105.8	16.8	77.0	12.2	12.1	±1.96	Reject
	1 : 1.5	s	1 : 4	s	Z	$Z_{\alpha/2}$	Decision
Friend	499.0	79.2	467.3	74.2	2.8	±1.96	Reject
Foe	77.0	12.2	92.5	14.7	-9.0	±1.96	Reject

Table 4. (Continued)

Densities							
Shots	1 : 1	s	1 : 1.5	s	Z	$Z_{\alpha/2}$	Decision
Friend	163.0	25.9	158.0	25.1	1.4	±1.96	Fail to reject
Foe	55.3	8.8	52.3	8.3	2.4	±1.96	Reject
	1 : 1.5	s	1 : 4	s	Z	$Z_{\alpha/2}$	Decision
Friend	158.0	25.1	186.0	30.0	-7.9	±1.96	Reject
Foe	52.3	8.3	76.0	12.1	-20.2	±1.96	Reject
Losses	1 : 1	s	1 : 1.5	s	Z	$Z_{\alpha/2}$	Decision
Friend	23.0	3.7	22.8	3.6	0.4	±1.96	Fail to reject
Foe	69.3	11.0	69.0	11.0	0.2	±1.96	Fail to reject
	1 : 1.5	s	1 : 4	s	Z	$Z_{\alpha/2}$	Decision
Friend	22.8	3.6	30.0	4.8	-14.1	±1.96	Reject
Foe	69.0	11.0	64.5	10.2	2.9	±1.96	Reject

Deployment							
Detections	Col	s	Fwd	s	Z	$Z_{\alpha/2}$	Decision
Friend	416.5	66.1	479.3	76.1	-6.7	±1.96	Reject
Foe	73.0	11.6	105.8	16.8	-20.0	±1.96	Reject
	Col	s	Rear	s	Z	$Z_{\alpha/2}$	Decision
Friend	416.5	66.1	434.2	68.9	-1.8	±1.96	Fail to reject
Foe	73.0	11.6	68.2	10.8	2.9	±1.96	Reject
Shots	Col	s	Fwd	s	Z	$Z_{\alpha/2}$	Decision
Friend	122.8	19.5	163.0	25.9	-14.6	±1.96	Reject
Foe	41.3	6.6	55.3	8.8	-15.1	±1.96	Reject
	Col	s	Rear	s	Z	$Z_{\alpha/2}$	Decision
Friend	122.8	19.5	144.0	22.9	-7.7	±1.96	Reject
Foe	41.3	6.6	46.6	7.4	-5.7	±1.96	Reject
Losses	Col	s	Fwd	s	Z	$Z_{\alpha/2}$	Decision
Friend	24.0	3.8	23.0	3.7	1.8	±1.96	Fail to reject
Foe	64.3	10.2	69.3	11.0	-3.5	±1.96	Reject
	Col	s	Rear	s	Z	$Z_{\alpha/2}$	Decision
Friend	24.0	3.8	21.6	3.4	4.5	±1.96	Reject
Foe	64.3	10.2	66.8	10.6	-1.7	±1.96	Fail to reject

In the comparison of units not equipped and units equipped with decoys, one may conclude that the addition of decoys to the friendly armored task force significantly enhanced the unit's combat effectiveness. Their ability to detect the enemy was enhanced due to the enemy's response to the presence of decoys. As one would expect, more shots were fired at the increased exposure of the enemy. Also, the friendly tank companies killed statistically more enemy combat vehicles (lethality) and lost fewer friendly tanks (survivability) when they employed decoys. The presence of decoys did not affect the enemy's ability to detect friendly tank companies. Thus the enemy did not fire any more or any less shots when decoys were present. The enemy's lessened ability to kill friendly tanks in the presence of decoys suggests that the enemy was firing at decoys for a considerable time.

Increasing the density of decoys to a 1 : 1.5 tank to decoy ratio caused no significant difference in friendly detections, shots, and kills of enemy vehicles. Based on the simulation, there was no benefit to increasing the number of decoys deployed beyond one decoy per tank. In fact, when the density of decoys was increased by a factor of four (1 : 4 tanks to decoys), there was an adverse effect for the friendly unit. With a 1 : 4 ratio of tanks to decoys, the friendly force acquired less, fired more, and killed significantly fewer enemy vehicles. This implies that the enemy was alerted to the deception. When one increases the number of decoys, the chance that an enemy will discover one of them increases too. Also, when units emplace decoys with no apparent concern for the scheme of maneuver, the operation is jeopardized. Other factors of mission, enemy, troops, terrain, and time (METT-T) are equally important to consider before one employs decoys at the tactical level of war. Decoys may actually gain the enemy's attention when and where it was not desired. The enemy, on the other hand, had trouble acquiring the friendly tanks when the tank to decoy ratio was decreased to 1 : 1.5, but when the ratio

was decreased to a 1 : 4 ratio, the enemy experienced an enhanced ability to acquire and kill the friendly tanks.

When decoys were placed forward of their battle positions, friendly units were able to acquire statistically more and kill statistically more enemy combat vehicles than when the decoys were collocated in their battle positions. The enemy also acquired more of the friendly tanks and fired more rounds at them when the friendly tank companies placed decoys forward of their battle positions. However, the enemy was not able to kill any more friendly tanks. Apparently, the enemy was surprised by this engagement.

Placing decoys to the rear of the friendly battle position proved to be rather unproductive. Although they fired more rounds, they were not able to kill any more of the enemy. However, the friendly force did survive the engagement with statistically more tanks when they place decoys to the rear as opposed to collocating decoys in their battle positions.

CASTFOREM Wargaming

In a fashion similar to the last section, this section is divided into two subsections entitled, Results and Statistical Tests. The results of the CASTFOREM simulations are provided in tabular form initially. Then graphs of the tabulated data are presented to facilitate an understanding of the tests which follow.

TRAC-WSMR conducted CASTFOREM wargames in support of the U.S. Army Belvoir Research, Development, and Engineering Center's (BRDEC's) effort to investigate the contribution of camouflage, concealment, and deception to tactical level operations.[6] The effect of adding decoys to the armored task force's tank companies was measured in terms of shots and kills. The base case consisted of an American armored task force equipped with no decoys. The performance of the base case task force was compared against the performance of like units equipped with twenty decoys (fixed throughout the

wargaming). This translates to a tank to decoy ratio of 1.4 : 1 (i.e., 28 tanks, 20 decoys). Also, collocacted decoys were compared to decoys positioned to the flank of the friendly battle position. The modeling of decoys in CASTFOREM was similar to the modeling of decoys in Janus.

Table 5.--CASTFOREM wargaming results

Base Case vs Flank		
Shots	No Decoys	Flank Decoys
Friend (by M1 tanks)	215.5	218.5
Foe (at M1 tanks)	54.1	43.8
Losses		
Friend (M1 tanks killed)	8.1	6.7
Foe (enemy CVs killed)	57.6	60.2
Base Case vs Collocated		
Shots	No Decoys	Collocated
Friend (by M1 tanks)	215.5	238.4
Foe (at M1 tanks)	54.1	40.0
Losses		
Friend (M1 tanks killed)	8.1	7.2
Foe (enemy CVs killed)	57.6	62.7
Flank vs Collocated		
Shots	Flank Decoys	Collocated
Friend (by M1 tanks)	218.5	238.4
Foe (at M1 tanks)	43.8	40.0
Losses		
Friend (M1 tanks killed)	6.7	7.2
Foe (enemy CVs killed)	60.2	62.7

Results

TRAC-WSMR, like ADEA, modeled an armored task force defending against a Soviet-style tank regiment in Central Europe. A total of twenty-one repetitions of each decoy employment configuration (i.e., base case of no decoys, flank emplacement of twenty decoys, and collocation of twenty decoys) were run to obtain an arithmetic mean of the performance measures (shots and kills). Table 5 lists the results of the CASTFOREM wargaming.

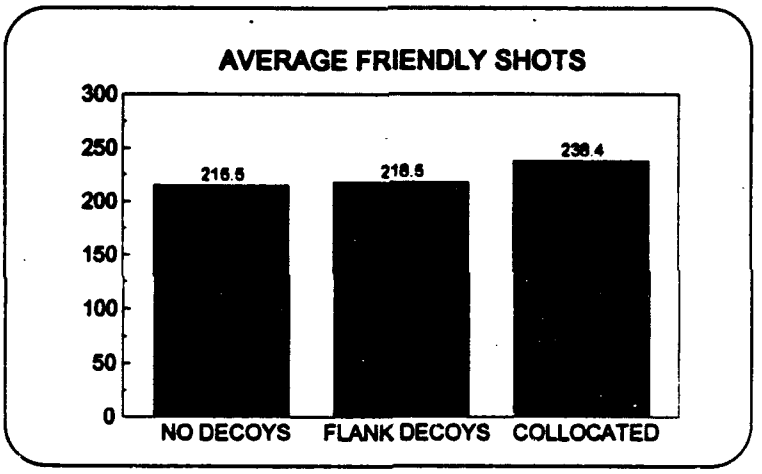

Figure 35. Average friendly shots (CASTFOREM deployment)

As depicted in Figures 35, the tank companies that emplaced decoys to their flank, fired an average of three more rounds at the enemy. This indicates that the friendly tank companies were presented with slightly more targets when decoys were positioned to their flank. On the other hand, Figure 36 shows that the enemy fired ten fewer rounds at the friendly force. Based on the shots fired, one could reasonably expect the number of

friendly kills to go up and the number of friendly losses to go down. When the decoys were collocated in the friendly battle position, the friendly units fired even more rounds (22 over the base case) at the enemy. The enemy was evidently surprised, firing 14 fewer rounds than the base case. Statistical tests will determine whether these observations are significant or not.

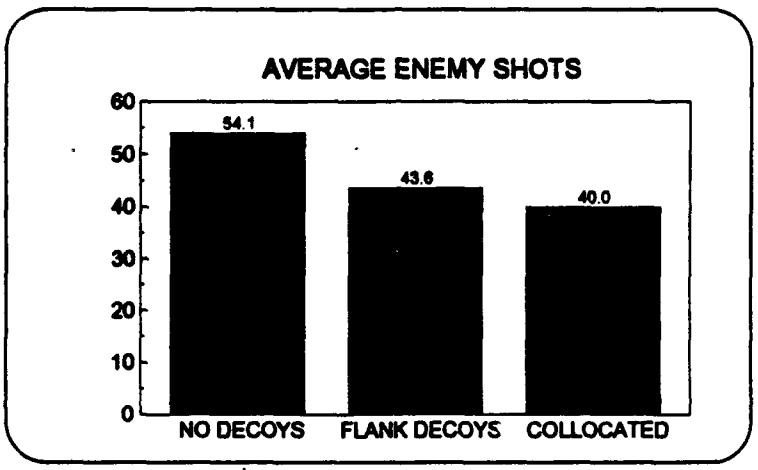

Figure 36. Average enemy shots (CASTFOREM deployment)

Figures 37 and 38 portray the results of the CASTFOREM simulations in terms of friendly and enemy losses. The employment of decoys to the flank caused an average of three more enemy losses and saved an average of two more friendly tanks. This attests to the gunners' skills but does not necessarilly mean that the tactical employment of decoys enhanced combat effectiveness in this case. When the decoys were positioned collaterally, the friendly force killed ten more tanks than the base case (Figure 37). The enemy killed

fewer friendly tanks when decoys were employed. The fewest friendly tanks were killed when the decoys were positioned to the flank of the friendly battle positions (Figure 38).

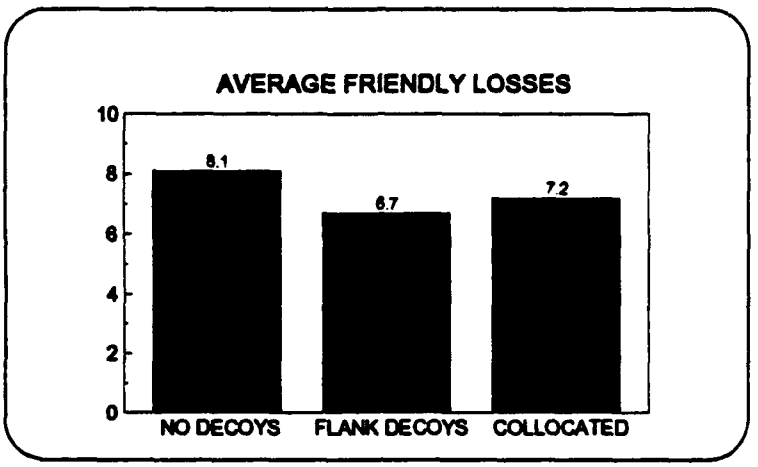

Figure 37. Average friendly losses (CASTFOREM deployment)

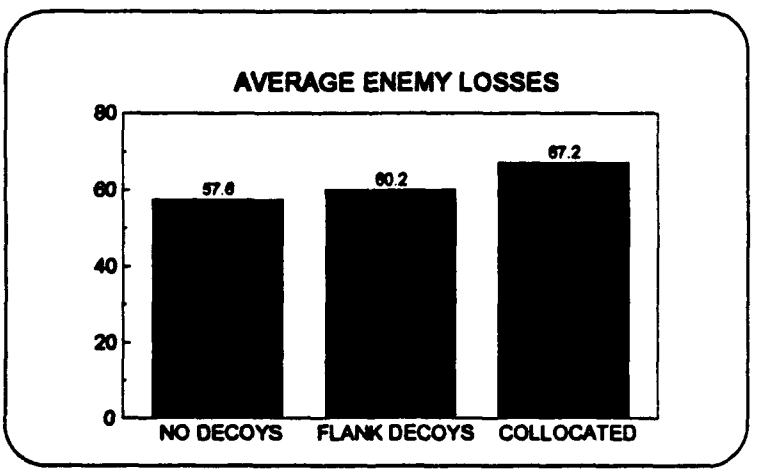

Figure 38. Average enemy losses (CASTFOREM deployment)

Statistical Tests

Although the hypothesis testing of CASTFOREM wargaming results is still based on the equivalence of population means, a different method is required to test the null hypotheses. This is due to the smaller sample size of CASTFOREM simulations (twenty-one runs vs forty-one Janus runs). If the sample size is smaller than 30, the variance fluctuates considerably from sample to sample and the distribution of

$$\frac{\bar{x} - \mu_0}{s\sqrt{n}}$$

is no longer a standard normal distribution.[7] The appropriate distribution for testing the null hypotheses is the *t* distribution, where

$$t = \frac{(x_1 - x_2) - d_0}{\sqrt{(s_1^2/n_1) + (s_2^2/n_2)}}$$

The critical region, depicted in Figure 39, is all values of *t* that are greater than $t_{v,\alpha/2}$ and less than $-t_{v,\alpha/2}$. The *v* degrees of freedom are determined by the equation

$$v = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{\frac{(s_1^2/n_1)^2}{n_1-1} + \frac{(s_2^2/n_2)^2}{n_2-1}}$$

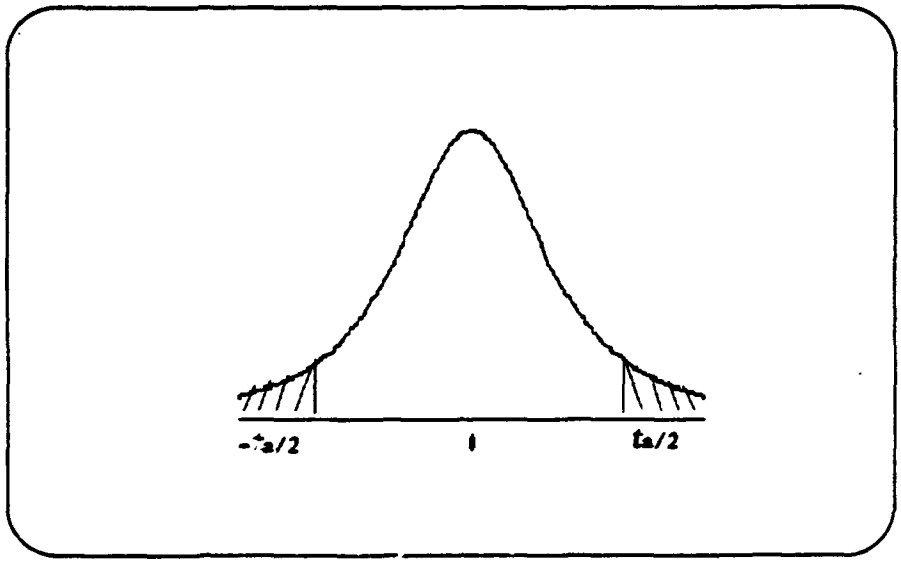

Figure 39. Critical region for CASTFOREM hypothesis tests

Table 6 lists the results of the hypothesis testing of each CASTFOREM decoy configuration and simulation. The formal and alternative hypotheses tested in each case was

$$H_0 : \mu_1 - \mu_2 = d_0$$
$$H_1 : \mu_1 - \mu_2 \neq d_0$$

where d_0 = zero, the hypothesized difference.

Table 6.--Statistical tests for CASTFOREM decoy configurations

Base Case vs Flank								
Shots	No Decoys	s	Flank	s	t	$\pm t_{v,\alpha/2}$	v	Decision
Friend	215.5	34.2	218.5	34.7	-0.3	±1.65	40.0	Fail to reject
Foe	54.1	8.6	43.8	7.0	4.3	±1.65	40.0	Reject
Losses								
Friend	8.1	1.3	6.7	1.1	3.8	±1.65	38.0	Reject
Foe	57.6	9.1	60.2	9.6	-0.9	±1.65	40.0	Fail to reject

Base Case vs Collocated								
Shots	No Decoys	s	Coll	s	t	$\pm t_{v,\alpha/2}$	v	Decision
Friend	215.5	34.2	238.4	37.8	-2.1	±1.65	40.0	Reject
Foe	54.1	8.6	40.0	6.3	6.1	±1.65	37.0	Reject
Losses								
Friend	8.1	1.3	7.2	1.1	2.4	±1.65	39.0	Reject
Foe	57.6	9.1	62.7	10.0	-1.7	±1.65	40.0	Reject

Flank vs Collocated								
Shots	Flank	s	Coll	s	t	$\pm t_{v,\alpha/2}$	v	Decision
Friend	218.5	34.7	238.4	37.8	-1.8	±1.65	40.0	Reject
Foe	43.8	7.0	40.0	6.3	1.8	±1.65	40.0	Reject
Losses								
Friend	6.7	1.1	7.2	1.1	-1.5	±1.65	40.0	Fail to reject
Foe	60.2	9.6	62.7	10.0	-0.8	±1.65	40.0	Fail to reject

The results of the CASTFOREM statistical tests show that the tactical employment of decoys enhanced combat effectiveness in one case and reduced combat effectiveness in the other. Placing the decoys to the flanks of the battle positions, proved to be the better strategy. The friendly force survived the battle with statistically more

tanks than when decoys were not employed at all. The simulations indicate that collocating decoys in one's battle position (compared with positioning the decoys to the flank), significantly increases the combat intensity of the battle. Both of the forces fired significantly more rounds at each other, and both friendly and enemy losses increased as a result; however, the proportion of friendly losses (7.2 or 7 percent) exceeded that of the enemy force (62.7 or 4 percent).

Interpretations

Results of the Janus and CASTFOREM simulations provide empirical evidence that the tactical employment of decoys may enhance combat effectiveness. However, a caveat is warranted. Just as care should be taken in employing any system in combat, the use of deception and decoys is no exception. The mere presence of decoys will not always enhance a unit's combat effectiveness. There must be a deliberate plan for the employment of decoys that is integrated early into the tactical scheme of maneuver. To emplace decoys haphazardly may very well lead to a unit's own destruction.

The Janus simulation results of this chapter have shown that varying the density of the emplaced decoys has an effect on the outcome of battle. It is possible for a unit to use too many decoys in support of the tactical operation. When a unit uses more than three decoys per section (1 : 1.5 vehicle to decoy ratio), it increases the probability that the deception will be discovered, and the tactical operation will be jeopardized.

Dr. Fred Feer (Rand Corporation) concluded from his observations at the NTC that a battle in which deception was successful, was more than five times more likely to succeed than one in which no attempt to deceive was made. One of the more successful deception techniques employed by the rotating units was the formation of false battle positions.[8] False battle positions frequently caused the OPFOR to deploy too early and generally fail to recognize the true disposition of friendly forces.

The Janus and CASTFOREM simulations support Dr. Feer's observations. Statistical analysis showed that using decoys to simulate battle positions forward or to the flank of the battle position is the preferred use for combat vehicle decoys. Units that position decoys forward treat them as obstacles that are covered by direct and indirect fire. Typically, the decoys are discovered (breached), but they do slow the enemy down and cause him to deploy his forces prematurely.

Positioning the decoys to the flank of the battle position is a more conservative approach to tactical deception. Although CASTFOREM simulations indicate that the flank positioning of decoys does not directly increase the lethality of a unit, it does cause more of the friendly force to survive. The surviving elements can then contribute to the lethality of subsequent engagements.

Collocating decoys within the unit's battle position, is the least preferred method of deployment. The CASTFOREM simulations indicate that using decoys as a bullet sump actually helps the enemy to find the friendly battle position. This leads to a fierce engagement that often leads to proportionately higher losses for the defending force.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this thesis is to determine whether the tactical employment of decoys can enhance combat effectiveness. This determination is based on qualitative and quantitative evaluations. The measures of combat effectiveness are the tactical unit's lethality and survivability. This chapter will present conclusions and recommendations based on the preceding analysis. Additionally, items for future study are provided.

Conclusions

While the Congress debates the Army's drawdown figures, one thing is certain. Tactical units will have to do more with less. Force projection requirements will demand commanders to seek innovative ways to fight and win our nations' wars and maintain peacetime conditions in operations other than war. Deception is one way to buy time during these force projection operations. During operations, deception can conceal true friendly force dispositions from the enemy and portray false dispositions. Hiding the real and portraying the false can confuse enemy decision-makers and cause them to imperil their forces.

Decoys, either field expedient or prefabricated (e.g., the MCCDs), offer the tactical commander feasible means to deceive his opponent and enhance his combat effectiveness. The thesis hypothesis (i.e., the tactical employment of decoys does not enhance combat effectiveness) is rejected. One can use decoys to support any of the categories of deception, the feint, demonstration, ruse and display.

There are generally four different objectives (discussed in Chapter 4) that the tactical commander pursues when he decides to include decoys in his battle plan. One may simply use them to increase the odds of survival in a defensive engagement. This method may be thought of as the bullet-sump method. Decoys can help a smaller unit simulate a larger unit. Also, future battle positions may be disguised with decoys to simulate obviously false battle positions. These "compromised positions" serve as excellent attack positions for launching a surprise attack at some time in the future. Finally, one may use decoys to simulate an independent battle position. When the enemy force sees false battle positions, he often deploys prematurely and offers the true friendly battle positions flank and rear shots.

Historical analysis (Chapter 3) showed that decoys may be used to defeat an air attack as well as a ground attack. Decoys tend to be more effective than camouflage alone in spoiling low-altitude air attack and observation. Dummy aircraft, airfields, factories, logistical sites, and even small towns may be employed to divert enemy aircraft away from the true facilities. Survival of the supporting units also promotes combat effectiveness just as much as the deception efforts that combat units take to enhance their own survival.

An important lesson that the tactical commander should take from past conflicts is that coordinating unit deception plans with adjacent units and higher headquarters avoids catastrophe. An effective use of decoys may actually compromise the operations of the parent unit and adjacent units if one attempts to deceive the enemy without regard for the higher mission and scheme of maneuver.

Janus and CASTFOREM simulations provide insights into the combat results of actual deployment of decoys. Table 7 lists decoy deployment schemes in their order or preference based on results of wargaming.

Table 7.--Decoy Deployment Schemes

1. Position decoys forward of battle positions.	Most preferred
2. Position decoys to the flank of battle positions.	Preferred
3. Position decoys behind battle positions.	Least Preferred
4. Collocate decoys within battle positions.	Not Preferred

Individual cases of mission, enemy, troops, terrain, and time (METT-T) may cause a tactical commander to chose a lesser preferred over a generally preferred deployment scheme. For example, in a hasty defense, there may not be enough time to deploy decoys as a separate false battle position. In this case, the tactical commander could consider collocating decoys within his battle position. However, if the objective is to divert enemy fires during the engagement, the unit should take care to ensure that the decoys are not too obvious. When the enemy discovers decoys early, even more enemy combat power may be brought to bear on the friendly position.

Increasing the number of decoys beyond one per vehicle offers no real improvement to combat effectiveness. It is possible to emplace too many decoys. Then the odds of the enemy discovering the deception increases and the friendly operation accepts a higher risk of defeat.

Recommendations

In view of the foregoing analysis, I offer the following recommendations.

1. Invest in decoys and their improvement. Although only a small number of tactical units have employed the MCCDs, those that have generally support the thesis that the tactical employment of decoys can enhance combat effectiveness. The two-dimensional nature of the current MCCD, is a major limitation. Units are forced to place MCCDs along a woodline or earthen mound to offer the enemy convincing visual and thermal images. Three-dimensional MCCDs would alleviate these problems and give the commander a great deal of flexibility in the use of decoys. Depending on the construction, three-dimensional decoys could also serve a disguises for more important targets. For example, an infantry fighting vehicle could be disguised as a cargo truck.

2. Develop and improve existing doctrine (both joint and service). Tactical commanders will, for the most part, continue to neglect deception until deception receives the attention it deserves in doctrine. Any potential investment in deception devices (e.g., MCCDs) requires equal attention to tactics, techniques, and procedures. A tactical commander should not have to wonder why his nation fielded a particular deception device. Also, when the same commander encounters enemy decoys on the battlefield, he should not be dumbfounded. To date, there is no relevant manual that describes the tactical employment of decoys. This should be rectified.

3. Continue wargaming deception and the use of deception devices such as decoys. Modern combat simulations provide extraordinary insight into force and concepts development. Also, in the future, care should be taken to secure the data generated by these simulations. It is very frustrating for researchers to discover that meaningful data has been lost or destroyed. The lack of raw data limited the analysis of this thesis.

4. Trained observers (in operations research) should be employed at the Army's combat training centers (CTCs). It is one thing to record history; it is another to collect useful scientific data. The CTC lessons recounted in this thesis are based primarily on

testimony of past players and on too few written reports. Again, there is very little raw data available to researchers in this area as well.

Topics for Future Study

1. Deception. Deception topics are numerous. Each deserves the attention of future researchers.

2. Spoofing. This thesis briefly mentioned this type of decoy which distracts enemy weapons systems from their true target (such as, aircraft, submarines, etc.). A study of the spoofing decoy will likely be highly technical in nature. Also, the work would probably require classification.

3. Deception, the term. A thought occurred to me during this study. What if the term deception was elevated in our doctrine to say, an element of the battlefield operating systems (BOS)? How would such a change be received? A visual model of the new BOS might look like Figure 40.

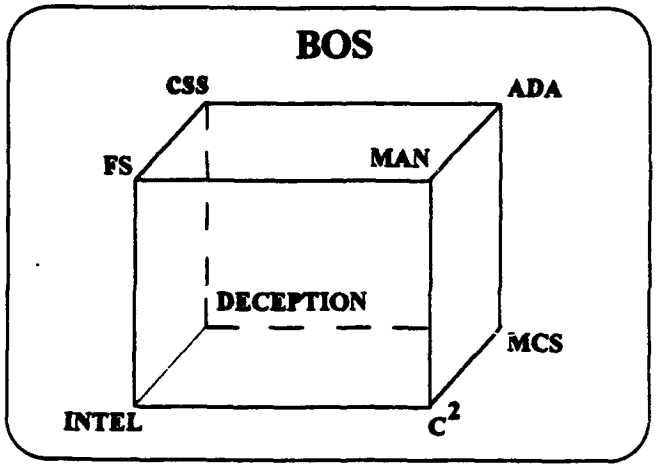

Figure 40. New BOS

The more prominent functions are on the front corners of the BOS cube. They are maneuver, command and control, intelligence, and fire support. Deception would not necessarily have to be promoted to BOS to get that level of attention. As depicted in Figure 40, deception could be tied into the BOS interpreted as an additional consideration and tied to intelligence. Deception requires synchronization into the concept of the operation just as any other function of the BOS.

Deception's role as a contributing factor to the nine principles of war should also be researched. Currently, U.S. Army doctrine ascribes deception as a contribution to surprise only. Deception can contribute to any principle of war. In the spirit of Sun Tzu, Figure 41 depicts this notion of deception contributing to all factors of war.

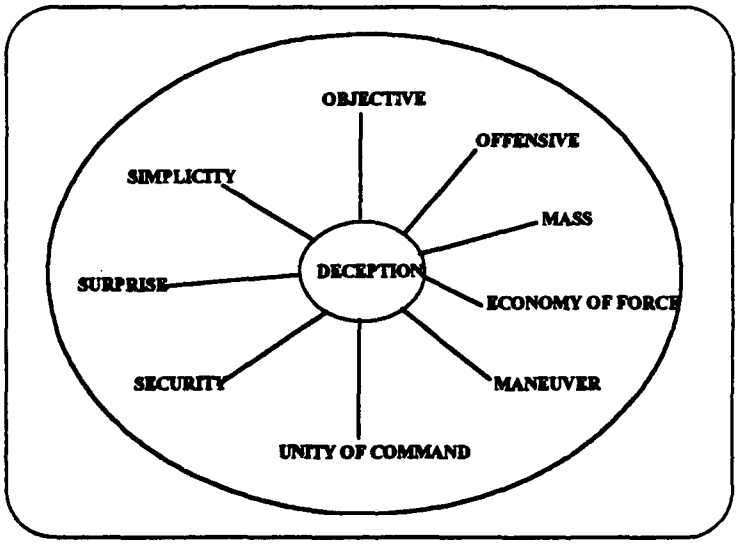

Figure 41. Deception, central to war

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GLOSSARY

Battlefield Operating Systems. The major functions performed by the force on the battlefield to successfully execute Army operations (battles and engagements) in order to accomplish military objectives directed by the operational commander; they include maneuver, fire support, air defense, command and control, intelligence, mobility and survivability, and combat service support. FM 100-5, Operations, (Washington D.C.: Department of the Army, 1993), G-1.

Combat effectiveness. Values that enables one to estimate the cost of any given operation or system and to balance this cost against other benefits resulting from the operation or system. Basically, "constants of the operation" that serve as equitable and usable units of comparison. For the purposes of this study, the measures of combat effectiveness will be limited to how well a tactical unit can destroy the enemy (lethality) and how well a tactical unit can survive in combat (survivability). George E. Kimball and Philip M. Morse, Methods of Operations Research, (Los Altos, CA: Peninsula Publishing, 1970), 38-45.

Deception. Those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests. JCS Pub. No. 1, Department of Defense Dictionary of Military and Associated Terms, (Washington D.C.: Joint Chiefs of Staff, 1984), 105.

Deception Objective. The ultimate purpose of the deception operation and presented as a mission statement. FM 90-2, Battlefield Deception, (Washington D.C.: Department of the Army, 1988), 1-37.

Deception Plan. Outlines which specific operations, displays, or secrets must be used to convey the deception story to the target. FM 90-2, 1-37.

Deception Target. The target of battlefield deception operations and the enemy decision-maker. FM 90-2, 1-37.

Decoy. An imitation in any sense of person, object, or phenomenon that is intended to deceive enemy surveillance devices or mislead enemy evaluation. FM 90-2, G-9.

Demonstration. A show of force on the battlefield where a decision is sought. No contact with the enemy is expected. FM 90-2, 5-14.

Display. A static production for enemy surveillance equipment that projects the deception story. Fm 90-2, 5-16.

Dummy. A simulated object used to camouflage an installation, serve as a decoy, or lend reality to a decoy situation. FM 90-2, G-9.

Events. Friendly indicators and actions that present specific parts of the total deception story to the enemy's intelligence sensors. FM 90-2, 1-38.

Feint. Offensive operations that require engagement of the enemy in order to give the appearance of a realistic main attack. FM 90-2, 5-12.

MCCD. The Multispectral Close Combat Decoy is a two dimensional dummy of a combat vehicle that produces both visual and infrared images representative of actual combat vehicle conditions. DEP 5-1080-202-12, 1-3.

Model. A description of a system or theory that accounts for its major properties or parameters. In this study, the term model refers to the algorithms and code that makeup the Army's force-on-force models Janus and CASTFOREM.

Ruse. Tricks (characterized by deliberately exposing false information to enemy collection means) designed to deceive the enemy to obtain an advantage. FM 90-2, 5-15.

Simulation. A model assigned specific parameters that are characteristic of a known system or technique. When the parameters involved in Janus or CASTFOREM are assigned a specific scenario and set of operational characteristics, the resulting model is a simulation. Often the terms are used interchangeably in research documents; however, in this study, the distinction is made.

Story. Friendly intention, capability, or disposition which the enemy is to be made to believe.

Tactics. The art and science of employing available means to win battles and engagements. FM 100-5, G-8.

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